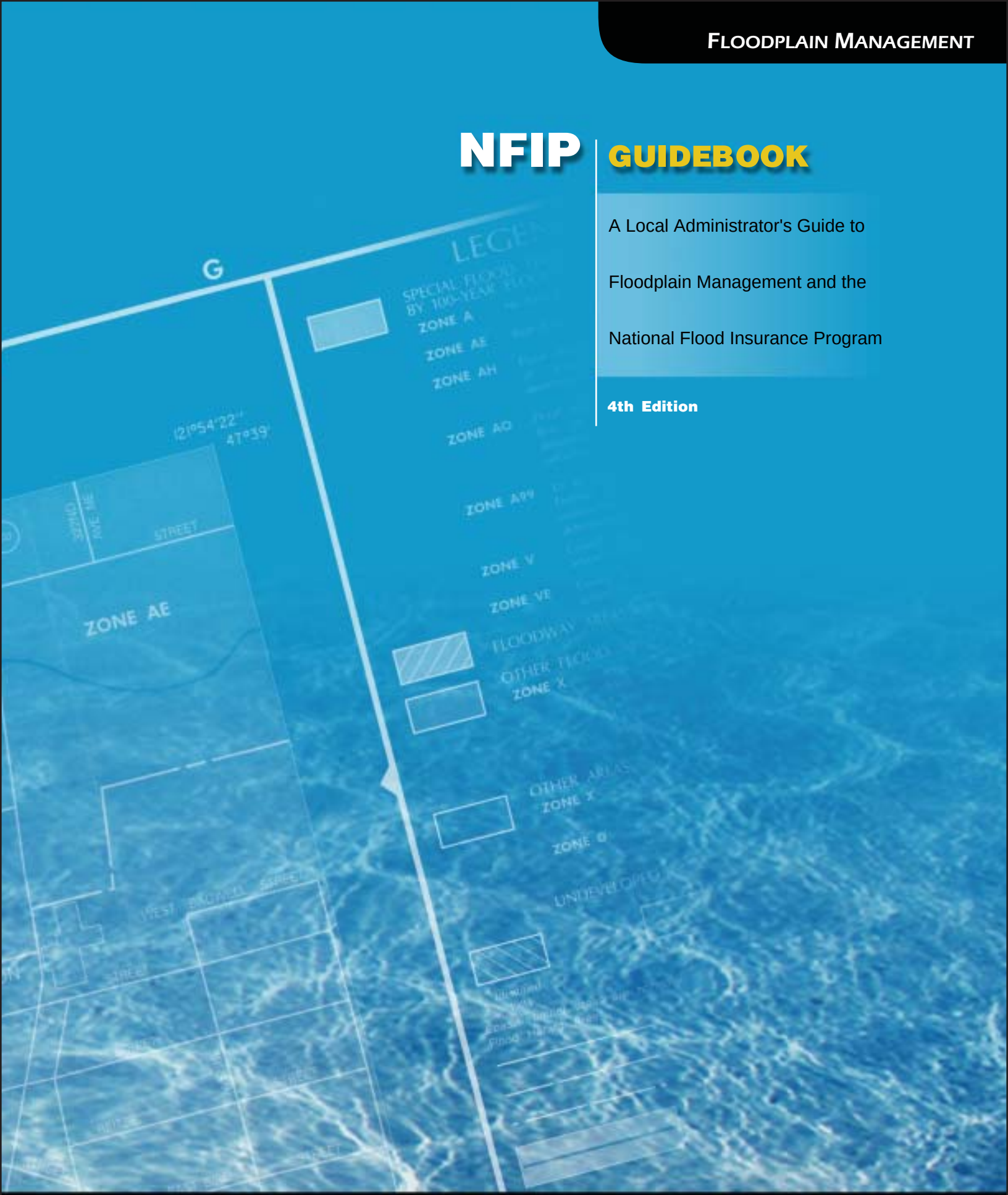
NFIP GUIDEBOOK

A Local Administrator's Guide to

Floodplain Management and the

National Flood Insurance Program

4th Edition



FEMA
REGION 10

NFIP

FLOODPLAIN MANAGEMENT GUIDEBOOK

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FEMA
REGION 10

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FLOODING IS A NATURAL OCCURRENCE.

Periodically, rivers, streams and lakes will overflow their banks and inundate adjacent land areas. These areas, known as floodplains, temporarily store this excess water. Flood damages only arise when man interferes with the natural flooding process by altering the watercourse, developing areas in the upper watershed, and/or building inappropriately in the floodplain itself.

The traditional solution to flood problems has been to construct structural protection works such as dams, diversions, levees and floodwalls. Despite tremendous expenditures for these structural projects, economic flood losses have continued to increase year after year. Given this, governments at every level have begun to see the solution to avoiding flood damages lies not in keeping the water away from people, but rather in keeping people away from the water. This philosophical shift lead to the creation of the National Flood Insurance Program (NFIP) in 1968, thereby codifying the concept of floodplain management.

The basic purpose of the NFIP is not to prohibit floodplain development, but to guide development in floodplain areas in such a way as to greatly lessen the economic loss and social disruption caused by impending flood events. The purpose of this guidebook is to assist local officials in their understanding of the NFIP and the procedures that communities should follow in administering their floodplain management ordinances.

Fact:

A recent study showed that only 2% of the claims paid for flood damages are for post-FIRM structures (structures built after the date of a community's flood map and adoption of a local FPM ordinance), whereas 98% of the claims paid are for older or pre-FIRM structures. This is strong evidence that the NFIP is successful at protecting new developments.

Flooding is a natural occurrence.

Floodplains are "built" by rivers. (Fig. A) Flood damages result when people build on floodplains without taking the river into account. (Fig. B)

Figure A

Figure B

CHAPTER 1 - FLOODPLAIN MANAGEMENT CONCEPTS

THE BASE FLOOD

Sometimes referred to as the 100-year flood, the base flood has a 1% chance of occurring in any given year. Although a 100-year flood sounds remote, keep in mind that over the life of an average 30-year mortgage, a home located within the 100-year flood zone (A or V zone) has a 26% chance of being inundated by the base flood over the life of the mortgage. This same home has less than a 1% chance of fire damage during the same period.

What is more significant is that the house in this example is almost certain to see a 10-year flood (96% chance) in the same 30-year mortgage cycle. In many areas the difference in flood heights between a 10-year and a 100-year event may be as little as one foot!

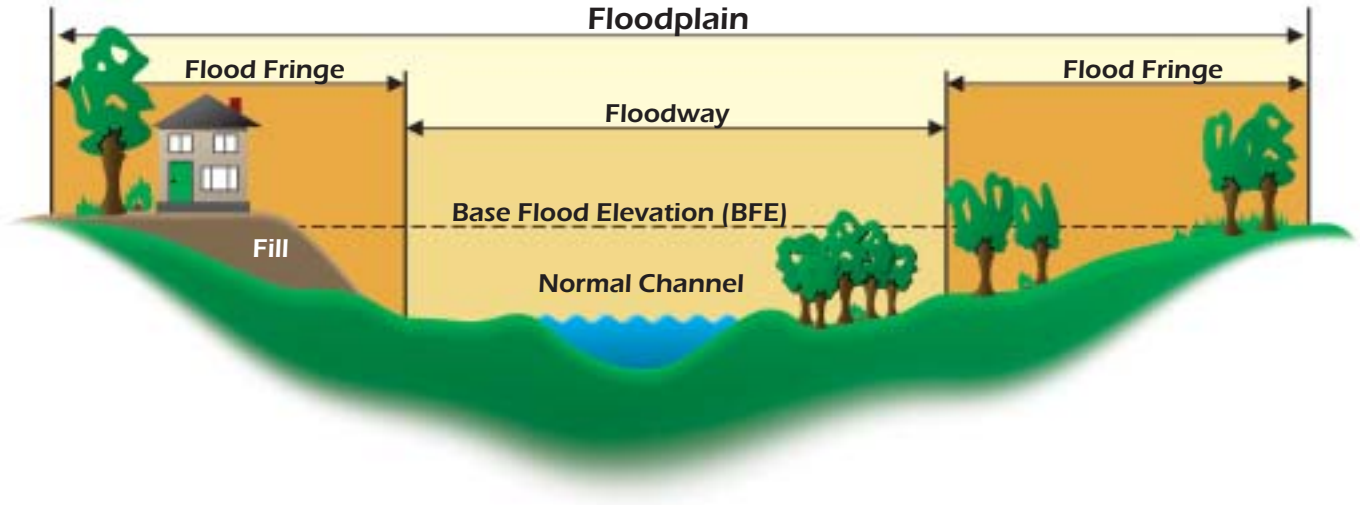
Flood Frequency Chart

Flood frequency (years)	Chance of flooding in any given year	Percent chance of flooding during 30-year mortgage
10	10 out of 100	96%
50	2 out of 100	46%
100	1 out of 100	26%
500	0.2 out of 100	6%

FLOODWAY

The flood way is typically the channel of a river or stream and the overbank areas adjacent to the channel. The floodway carries the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest and most destructive. Regulations require that the floodway be kept open so that flood flows are not obstructed or diverted onto other properties.

Characteristics of a Floodplain



Base Flood Elevation (BFE)

The BFE is the elevation (normally in feet above sea level) which the base flood is expected to reach.

The Special Flood Hazard Area

For purposes of the NFIP, the area that would be inundated by the base flood is also called the special flood hazard area (SFHA), or simply the floodplain.

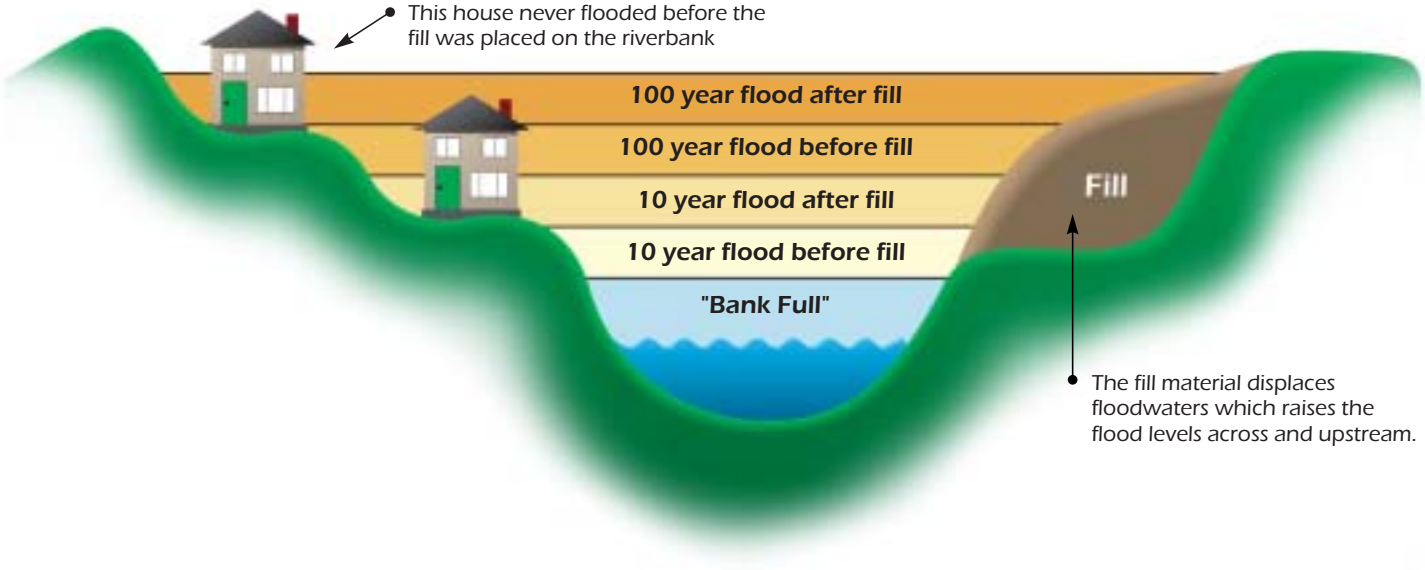
Flood Fringe

The area on either side of the floodway is called the flood fringe. This area is subject to inundation by the base flood but conveys little or no velocity flows.

Fill

By nature, floodplains are low-lying areas which seem to invite filling activities. Filling is included under the NFIP definition of "development" and therefore requires a floodplain development permit. Care should be taken to ensure that the fill will not alter drainage or divert flood water to other properties. Filling is prohibited in the floodway.

The Effects of Fill on a Floodplain



CHAPTER 2 - MAPPING AND MAP REVISIONS

FLOODPLAIN MAPS

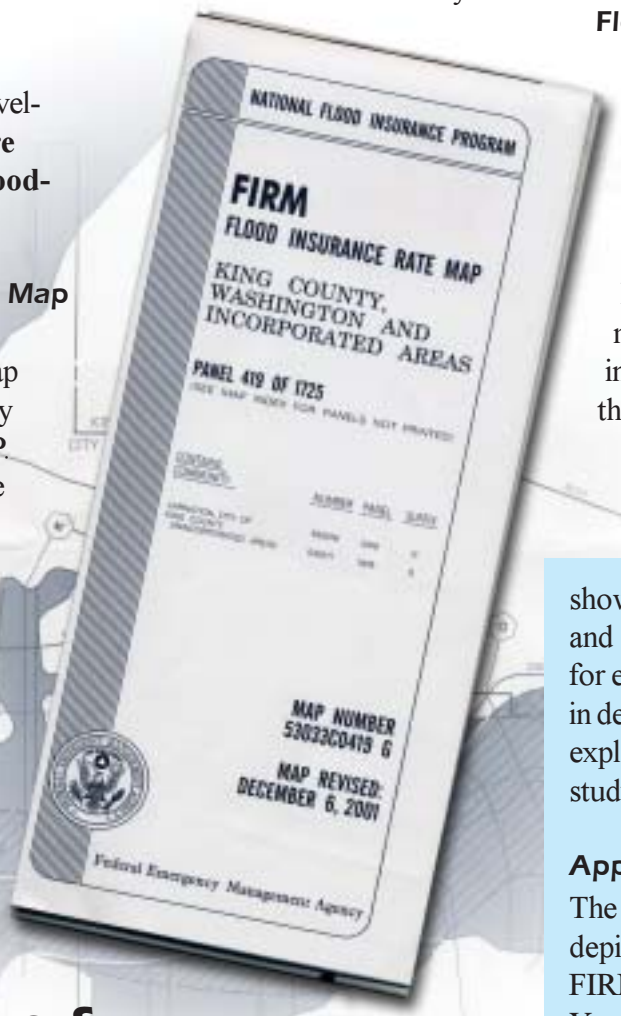
Floodplain maps are the basis for implementing floodplain regulations. The maps vary in detail depending on several factors including the amount of historical data, the detail of the base topographic maps, the flood threat, and the floodplain development potential. **There are basically three types of floodplain maps:**

Flood Hazard Boundary Map (FHBM)

This is a very generalized map usually issued to a community when they first join the NFIP. FHBMs do not include Base Flood Elevations (BFEs). Only a handful of communities still possess these basic flood maps.

Flood Insurance Rate Map (FIRM)

Most communities have a FIRM. They generally include BFEs and flood zones and are based on a detailed study. With the FIRM, flood elevations at any specific development site within a community can usually be determined. More recently published FIRMs include both BFEs and regulatory floodways.



Flood Boundary and Floodway Map

These maps delineate floodways but do not give BFEs or flood zones. A community must use its FIRM to identify BFEs. Newer FIRMs eliminate the dual maps; all information, including floodways, is on the newer FIRMs.

THE FLOOD INSURANCE STUDY

The Flood Insurance Study (FIS) is prepared by FEMA to determine the flood hazard present in the community as well as the insurance zones that will be used to write flood insurance. The data in the FIS is used to produce the flood maps mentioned above. The FIS provides detailed and accurate flood hazard information that includes a written report containing a description of a community's flooding conditions, and flood profiles showing the 500, 100, 50 and 10-year flood elevations for each stream reach studied in detail. The following explains the two types of study approaches used:

Approximate

The approximate study, depicted as zone A on the FIRM, delineates the "100 Year" floodplain boundaries. The boundaries are established by reviewing existing data such as a Flood Hazard Boundary Map, USGS Flood Prone Quadrangle Map, US Army Corps of Engineer Floodplain Information report, and other historical data and transferring this

information to the FIRM. If no existing data is available, then a rough hydrologic analysis is performed to determine the width of the floodplain. The approximate study generally involves little or no field work. **The base flood elevation or depths are not determined.** These areas are also referred to as unnumbered A-Zones.

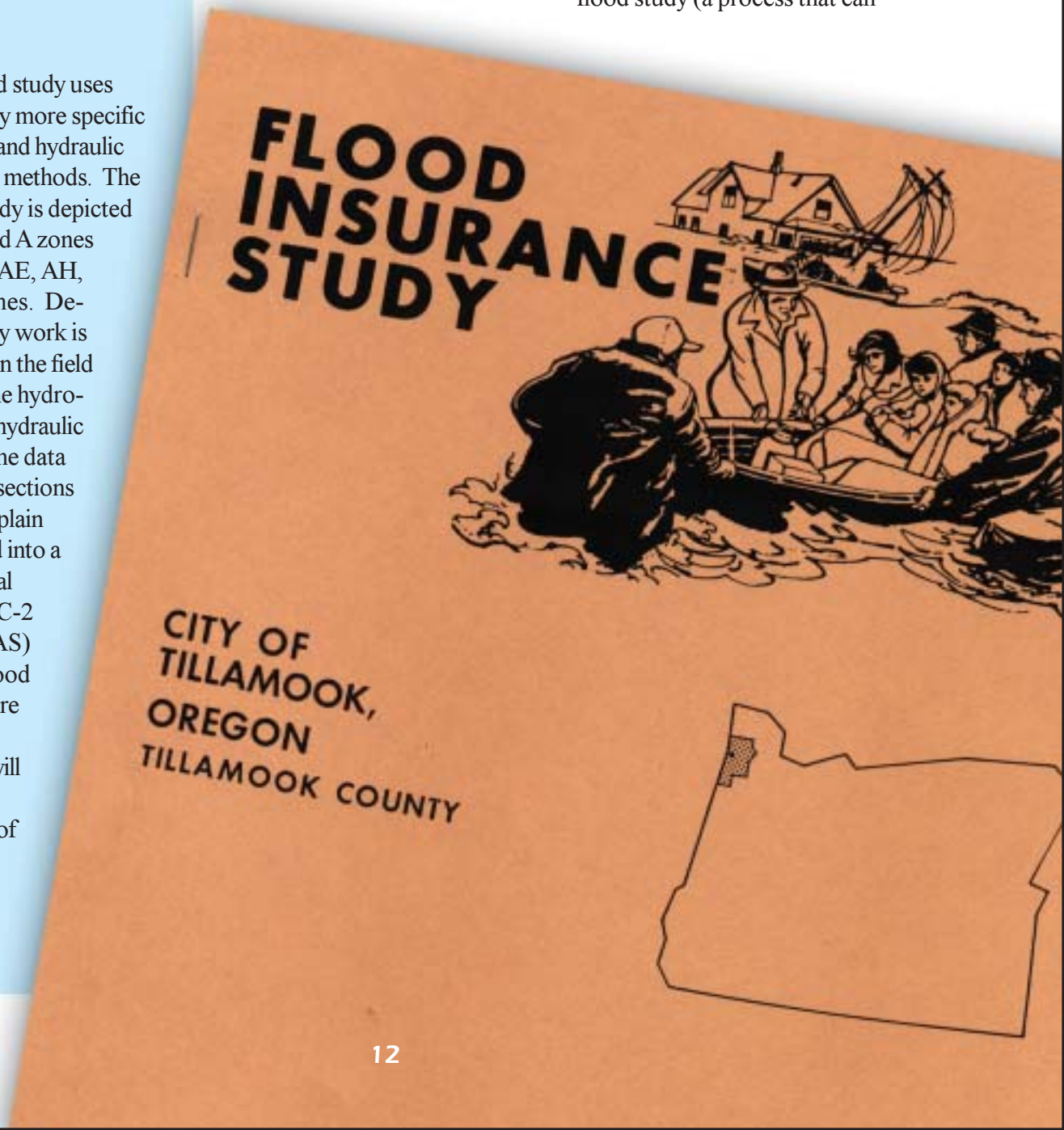
Detailed

The detailed study uses considerably more specific hydrologic and hydraulic engineering methods. The detailed study is depicted as numbered A zones (A1-A30), AE, AH, and AO zones. Detailed survey work is conducted in the field for use in the hydrological and hydraulic analysis. The data from cross sections of the floodplain are inputted into a mathematical model (HEC-2 or HEC-RAS) and base flood elevations are determined. This often will also include delineation of a floodway and the 500-year floodplain.

Floodplain Map Studies and Restudies

Periodically, FEMA in consultation with our State partners, conducts floodplain studies and restudies to update a community's FIRMs. FEMA's decision to conduct a flood study or to restudy a particular stream is based on numerous variables including funding availability, local community desire for a study/restudy, evidence that the existing flood hazard data is inaccurate, development potential, and NFIP policies in force.

Usually following a request from local officials, FEMA will conduct a scoping meeting to determine general study/restudy needs. Then, at a Time and Cost meeting, local officials meet with FEMA staff and the FEMA study contractor to discuss specific study/restudy issues. Once a study contractor completes the flood study (a process that can



take a few months to a few years), the following steps are taken leading ultimately to a new effective FIRM for your community:

1 Draft FIS/FIRM and Technical Study Data Notebook, completed by the study contractor, is delivered to FEMA

2 Draft data is reviewed by FEMA and Map Coordination Contractor

3 Preliminary FIS/FIRM is delivered to local community(s)

4 Final Coordination Meeting, involving local community, FEMA, and study contractor, is held with the public

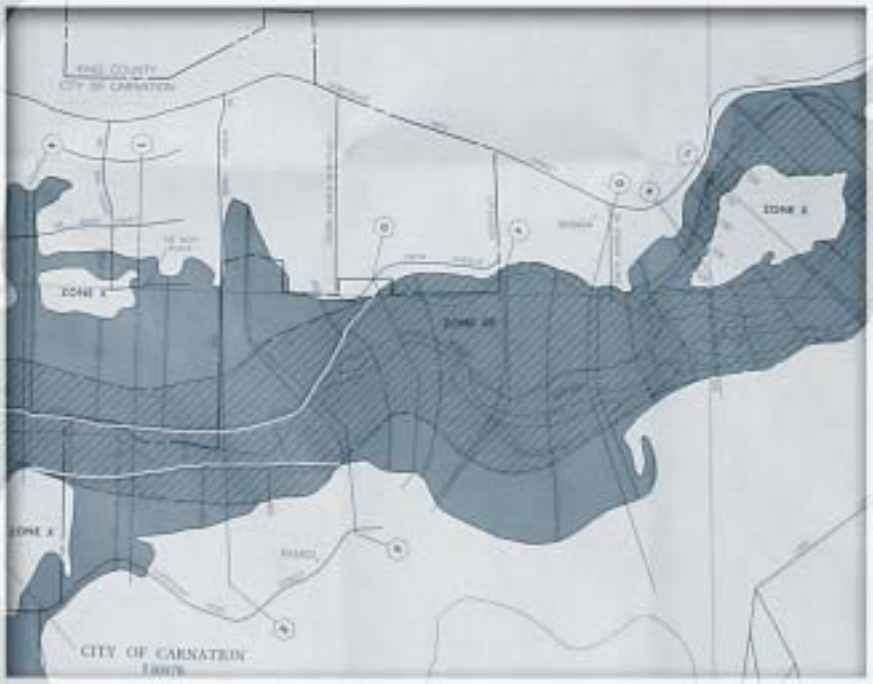
5 Notice of Start of Appeals period appears in local newspaper

6 90-day Appeals Period commences

7 90-day Appeals Period ends

8 Letter of Final Determination Review is sent to communities (FIRMs will be effective in 6-months).

9 Final "Official" FIS/FIRMs are delivered to communities – must amend flood ordinance to reflect new maps



Typical Flood Insurance Rate Map (FIRM)

MAP REVISIONS

Sometimes it is necessary for floodplain data to be revised. In most instances, FEMA will not republish an entire map, but will simply issue a letter which revises the flood map. Generally, there are five reasons why an individual flood map panel may need to be changed. They are as follows:

- Revisions to correct a minor error
- Revisions based on better ground elevation data
- Revisions based on authorized filling in the floodplain
- Revisions based on better flood data
- Revisions based on new flood works

There are three main types of map revisions.

1. **Letter of Map Amendment**
   A Letter of Map Amendment, often called a LOMA, is a procedure in which FEMA reviews technical data submitted by the property owner who believes a property or structure was incorrectly included in a designated flood hazard area. (MT-1 Form). A LOMA amends the current floodplain map and establishes that the property or structure is not located in a special flood hazard area.

   LOMAs are used to verify that natural ground elevations are above the base flood elevation (BFE). LOMAs can waive the flood insurance

requirement for loans if accepted by the lender. An Elevation Certificate (EC) supports a LOMA but, by itself, does not remove the insurance requirement.

2. **Letter of Map Revision Based on Fill (LOMR-F)**
A LOMR-F removes land from the SFHA that has been graded or filled (physical changes) since the date of the map. (MT-1 Form). Communities must concur with requests before a LOMR-F is approved by FEMA. LOMR-Fs also can waive the flood insurance requirement for loans. LOMR-F requests for multiple lots must certify compaction of fill.

3. **Physical Map Revision (LOMR PMR)**
Any map revision other than simple fill, requires an engineering analyses—e.g. bridge, culvert, channel, levee, berm, hydrology, hydraulics, or combination thereof. (MT-2 Form)

How is a LOMA/LOMR-F Issued?

Requests for LOMAs and LOMR-Fs are now required to be submitted on forms provided by FEMA which include the following information:

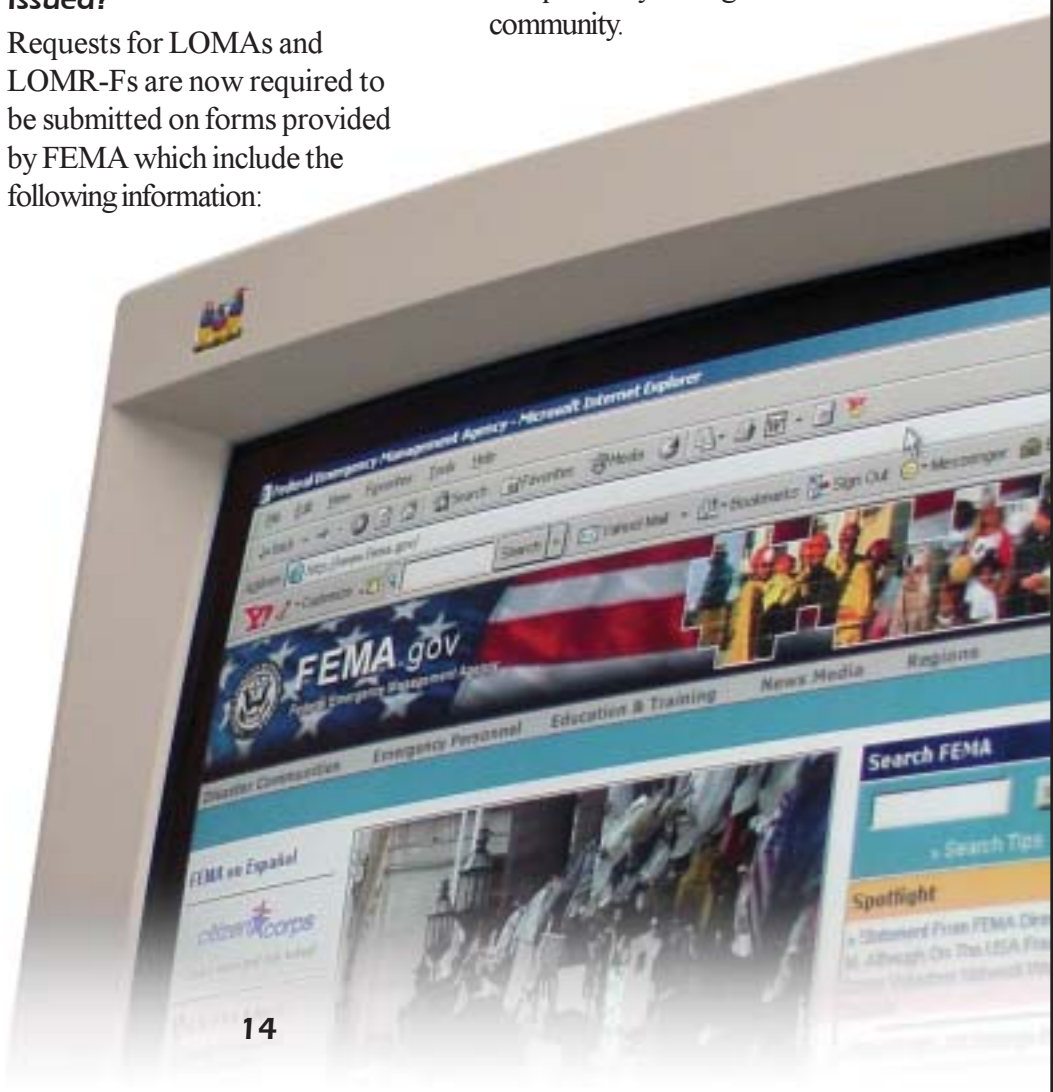
- Property Information Form - may be completed by property owner
- Elevation Information Form - must be completed by a licensed engineer or land surveyor
- Summary of Elevations (Individual Lot Breakdown Form) - must be completed by an engineer or land surveyor if more than one lot is involved.
- Community Acknowledgment Form - used for LOMR-Fs completed by community.
- Certification of Fill Compaction Form - used for LOMR-Fs greater than a single lot, completed by an engineer or community.

LOMA Information

To receive a MT-1 form packet (LOMA/LOMR-F) contact FEMA Region 10 or find the packet on FEMA's web site: www.FEMA.gov

LOMA/LOMR-F requests for both single and multiple lots are submitted to FEMA Headquarters in Washington D.C. and take 3 to 6 weeks to process.

For Questions on how to complete the forms, or to check the status of a LOMA/LOMR-F — please call the FEMA Map Assistance Center at 1-877-FEMA-MAP, or call FEMA Region 10 at 425-487-4600



CHAPTER 3 - THE NATIONAL FLOOD INSURANCE PROGRAM

To participate in the National Flood Insurance Program (NFIP), a community must adopt and enforce a floodplain management ordinance that regulates development in the community's floodplain. The two fundamental objectives of the NFIP are: (1) to ensure that new buildings will be free from flood damage; and, (2) to prevent new developments from increasing flood damages on existing properties. It should be noted that the NFIP is but one component of a community's floodplain management program.

NATIONAL
FLOOD
INSURANCE
PROGRAM

THE COMMUNITY ASSISTANCE VISIT (CAV)

Periodically the Federal or State flood insurance coordinator(s) will visit your community to conduct a Community Assistance Visit (CAV). The purpose of the CAV is to assist the local floodplain coordinator and other local officials in enforcing the community's floodplain management ordinance.

The CAV also seeks to evaluate the local floodplain management program vis-à-vis the regulations governing the NFIP. A CAV includes the following: a meeting with local staff to discuss procedures used in issuing development permits and review permit files; a check of building permits and elevation documentation to see if new development is being regulated according to the requirements of the local code; and a tour of the flood hazard areas. A follow-up letter is sent to the chief elected official, and a report is filed with the Federal Emergency Management Agency on the findings of the visit.

During a typical NFIP CAV the following issues are often discovered:

Record Keeping Systems

Often, record keeping systems are not adequate to assure that elevations are adequately communicated prior to construction, and maintained properly so that subsequent buyers will not have to pay for another elevation survey.

Permits for "Other Development"

Many communities, although they have adequate floodplain management ordinances, do not have a permit process to cover all "other development", which includes such activities as mining, drilling, dredging, grading, paving, excavations and filling in flood hazard areas.

History:

The National Flood Insurance Program was created by Congress in 1968 to minimize the ever rising disaster relief costs and to reduce the loss of life and property caused by flooding. The Program has four goals:

1 Provide flood insurance coverage not generally available in the private market.

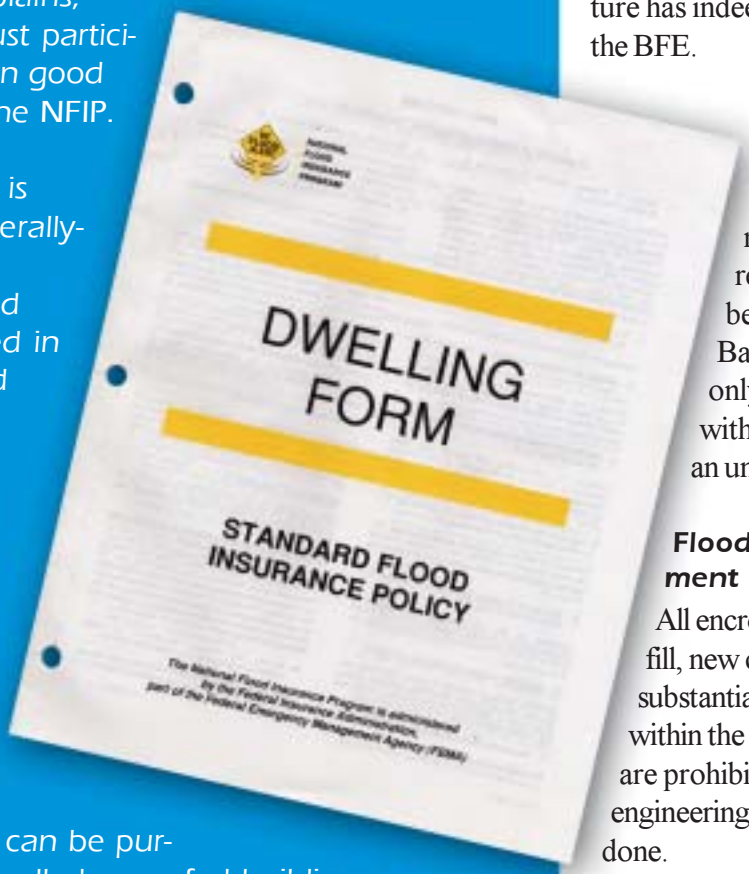
2 Stimulate local floodplain management to guide future development.

3 Emphasize less costly nonstructural flood control regulatory measures over structural measures.

4 Reduce Federal disaster costs by shifting the burden from the general taxpayer to floodplain occupants.

About Flood Insurance

- Federal flood insurance is only available in those communities that participate in the National Flood Insurance Program.
- In order to receive Federal disaster assistance in identified floodplains, communities must participate in, and be in good standing with, the NFIP.
- Flood insurance is required for federally-backed loans to purchase or build structures located in any special flood hazard area.
- Flood insurance can be purchased from any agent who is licensed to write property and casualty insurance.



- Flood insurance can be purchased for any walled or roofed building anywhere in a participating community regardless where the structure is located.
- The NFIP does not cover basement contents or finished portions of a basement.
- Rates are subsidized for Pre-FIRM buildings; actuarial rates for Post-FIRM structures.
- There is a waiting period of 30 days before coverage goes into effect; There is no waiting period when transferring titles of properties to new owners.

As-Built Elevation Certificates

Communities do not often secure as-built certifications of the lowest floor elevation. Elevation documentation based on plans and drawings is insufficient to assure that the lowest floor of the structure has indeed been built above the BFE.

Definition of Lowest Floor

There is often misunderstanding regarding space below the lowest floor. Basically this should only be a crawl space with proper openings or an unenclosed garage.

Floodway Encroachment

All encroachments, including fill, new construction and substantial improvements within the regulatory floodway are prohibited – unless an engineering no-rise analysis is done.

Floodproofing

Only non-residential structures can be floodproofed, and then only dry-floodproofed (water tight).

Alteration of Watercourses

Although there is no prohibition against altering watercourses (except in a designated floodway), there is a requirement to notify adjacent communities, the State Coordinating Agency and FEMA.

Mobile Home Anchoring

All mobile homes placed in a flood hazard area are required to be anchored to a permanent foundation, including those in existing mobile home parks.

Note: Chapter 6 "NFIP Development Standards" provides a detailed explanation of each of the issues listed above.

EFFECTS ON LENDERS

The purchase of flood insurance applies to all mortgage properties which fall under one of the following three criteria: the owner is applying for a federally backed (VA, FHA, etc.) loan; the lending institution is federally regulated; or the loan will be sold on the secondary market to a Government Sponsored Enterprise (GSE) such as Fannie Mae or Freddie Mac. This comprises well over 95% of all mortgage loans made each year.

The lender must first determine whether the structure is in a Special Flood Hazard Area (SFHA). This is done using an approved Standard Flood Hazard Determination Form.

For all properties located in a SFHA, lenders must require flood insurance when making, increasing, extending or renewing a loan. This requirement only applies when the structure is in the SFHA, not the lot. Lenders must ensure that coverage remains in effect for the life of the loan. A GSE such as Fannie Mae or Freddie Mac must ensure that any loans they purchase have flood insurance, if required.

If a loan has escrows for taxes, insurance or for any other reason, the lender must then escrow for flood insurance too. Lenders are required to notify borrowers if their building is in a SFHA and that they have 45 days to purchase flood insurance. After 45 days, lenders have the statutory authority to force place flood insurance. If a borrower believes the flood zone determination was in error the borrower and the lender must jointly request a review from FEMA, with appropriate supporting technical information.

THE COMMUNITY RATING SYSTEM (CRS)

The NFIP's Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimal requirements of the NFIP by reducing flood insurance premiums for the community's property owners. Discounts to premiums range from 5% to 45%.

The CRS recognizes 18 floodplain management activities available for credit divided into four categories:

Flood Preparedness Series

This series credits flood warning, levee maintenance and dam safety programs.

Flood Damage Reduction

This series credits programs for areas in which existing development is at risk. Credit is provided for a comprehensive flood mitigation plan, relocating, elevating or retrofitting floodprone structures, and maintaining drainage systems.

Public Information

This series credits programs that advise people about the flood hazard, flood insurance, and ways to reduce flood damage.

Mapping & Regulations

This series credits programs that provide increased protection to new developments. These activities include mapping areas not shown on the FIRM, preserving open space, enforcing higher regulatory standards, and managing stormwater.

INCREASED COST OF COMPLIANCE

ICC coverage provides for the payment of a claim for the cost to comply with State or community floodplain management laws or ordinances after a direct physical loss by flood. When a building covered by a Standard Flood Insurance Policy under the NFIP sustains a flood loss and the community declares the building to be substantially or repetitively damaged, ICC will help pay for the cost to elevate, floodproof, demolish, or relocate the structure up to a maximum of $20,000.

CHAPTER 4 - FLOODPLAIN MANAGEMENT AT THE LOCAL LEVEL

A COMMUNITY'S RESPONSIBILITIES UNDER THE NFIP

The management of the NFIP in a community consists of a partnership between the Federal government and the local community. The responsibilities of the local community are as follows:

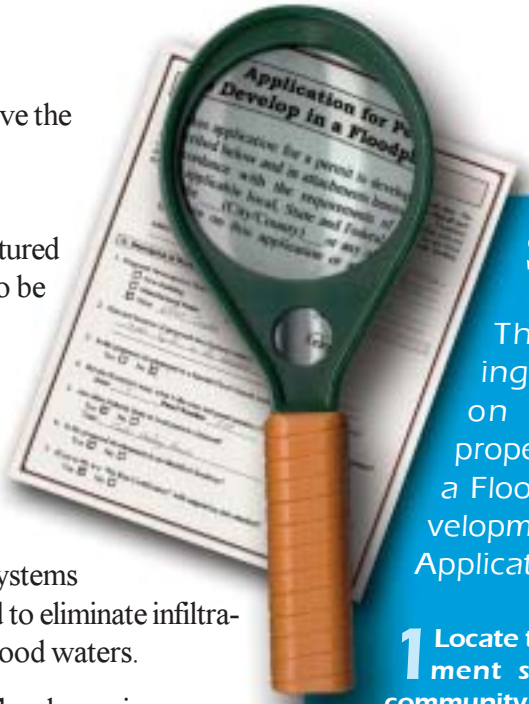
- Require development permits for all proposed construction and other developments within the community's designated 100-year floodplain.
- Review the permit to assure that sites are reasonably safe from flooding.
- Review subdivision proposals to determine whether the project is safe from flooding and provides for adequate drainage.
- Require residential structures to have the lowest floor (including basement) elevated at least to or above the Base Flood Elevation (BFE).
- Require non-residential structures to have the first floor elevated or floodproofed one foot above the BFE.
- Require manufactured homes to be elevated and anchored.
- Require water supply systems designed to eliminate infiltration of flood waters.
- Assure flood carrying capacity of altered or relocated watercourses is maintained.
- Require new and replacement sanitary sewage systems be designed to minimize or eliminate infiltration of flood waters.
- Maintain records of all development permits.
- Verify/document lowest floor elevations of new or substantial improvements.

THE DEVELOPMENT PERMIT

Communities participating in the NFIP must require development permits for all proposed developments within the designated 100-year floodplain. The permit, along with all development plans, must be submitted for approval to the appropriate local authority before beginning any development activity. Usually this authority is the local floodplain administrator.

What Information Should the Permit Contain?

In addition, obvious information, such as the applicant's name, address, and phone number, a development permit should also



8 Steps

The following are steps on how to properly review a Floodplain Development Permit Application:

1 Locate the development site on the community's floodplain map. If the project site is obviously outside the shaded A-Zone or V-Zone, then floodplain regulations do not apply. If the project site is in a shaded A-Zone or V-Zone (or is a borderline question), proceed to the next step.

2 Ensure project meets the NFIP/local ordinance definition of "development." See the previous page for the type of activity that is considered development. As a general rule of thumb, anything that alters the natural topography of the floodplain needs a permit review. Please be advised that development does not include: maintenance of existing buildings and facilities; resurfacing of roads; gardening, plowing and similar agricultural practices that do not involve filling, grading or construction of levees.

3 Have the owner/developer fill out a local Building Permit Application. A location or plat map of the site should be attached to every application form. Plans of the proposed development should also be attached showing existing and proposed conditions including all appropriate dimensions and elevations. Check to see if the site is located in the regulatory floodway by measuring the floodway width on the Floodway Map and comparing this distance to the proposed project's actual ground location. Development cannot occur in any floodway without a detailed analysis from a licensed engineer and/or hydrologist proving that the development will cause no-rise in the base flood elevation.

4 Check to see if the project includes a new building or a substantial improvement of an existing building. A "building" is a structure that is principally above ground and is enclosed by walls and a roof including manufactured homes and prefabricated buildings. The term also includes recreational vehicles and travel trailers to be installed on site for more than 180 days.

When a Pre-FIRM building is proposed to be remodeled, renovated, rehabilitated, added to or in anyway improved, the proposed modifications must be evaluated for "substantial improvement". If the total costs of the improvement are 50 percent or more of the building value, the building must be elevated above the BFE. If the project includes a new "building" or "substantial

contain the following information:

- The location of the proposed development
- A site map
- Description of proposed activity
- Elevation of ground site prior to development
- Elevation to which lowest floor of the structure must be built
- Elevation to which structure will be flood-proofed (non-residential only)
- Base flood elevation data for subdivisions
- Description of water course alterations
- A space for approving or denying the permit
- A space for signature and date

When Is a Development Permit Required?

All development within the regulatory floodplain requires a permit. Development includes:

- new construction or a substantially improved structure
- placing a manufactured (mobile) home
- mining, dredging, filling, grading or excavating
- roads, bridges and culverts
- altering or relocating stream channels
- travel trailers placed on site for more than 180 days
- storage of materials including gas or liquid storage tanks

Duties of the Floodplain Administrator

The duties of the local floodplain administrator are quite varied. One thing he/she does is to review and evaluate development permit applications. Reviewing and evaluating permits involves several things, including:

- Making permit applications available to prospective developers
- Checking applications for completeness
- Checking development locations on floodplain maps
- Determining if development affects the floodway
- Determining BFE for site
- Establishing first floor elevations
- Requiring additional Federal/State/Local permits
- Determining if watercourse alterations will reduce carrying capacity
- Using best available data when FEMA has not provided BFEs

Another duty of the local floodplain administrator is to issue permits. This involves assuring that each application meets NFIP criteria and involves issuing conditions permits for lowest floor

elevation and construction standards. In the event that the application does not meet NFIP criteria he/she must also deny the permit.

Once the project has begun it is also the duty of the FPA to check the progress of development. This includes field checking the location and the lowest floor elevation. The lowest floor elevation must be checked before framing of the development structures begins. The FPA must also insure that construction occurs in conformance with approved plans.

An Elevation Certificate will also need to be issued by the floodplain administrator. They must check the elevation of the lowest floor to see if it is above or below BFE. An elevation certificate is then issued establishing the status of the elevation.

The floodplain administrator must also maintain records of floodplain development. This simply involves keeping track of the number of floodplain development permits that he/she issues, and retaining copies of those permits and elevation certificates as well.

RECORD KEEPING

One of the jobs of the local floodplain manager is to maintain the required records according to NFIP regulations. The following records must be kept on file and open for public inspection:

- A complete and up-to-date copy of the floodplain ordinance
- The current flood map (FIRM, Floodway, and FIS)
- A copy of the NFIP regulations
- A project file for each development permit issued. The project file should contain the following:

improvement," go to Step 5.

5 Obtain the Base Flood Elevation at the site:

- From the Flood Insurance Rate Map (FIRM)
- From the profiles found in the Flood Insurance Study (FIS).
- From any other Federal, State or local source - commonly called "best available data".
- If there is no base flood elevation (BFE) data available, you may want to require the applicant to determine the BFE.

6 Review the construction plans to make sure that the lowest floor of the building is built to, or above, the base flood elevation (BFE). Some states and communities require the lowest floor to be built one or two feet above the BFE. Check your local floodplain ordinance. Building protection can be done by one of three methods:

- Elevate on fill. Check the plans to ensure that: the top of the fill is at or above the BFE; the fill is protected from erosion and scour; the fill is properly compacted; and, the fill does not cause drainage or flow on to neighboring properties.
- Elevate on piers, posts, columns or walls. Check the plans to ensure that materials used below the lowest floor are resistant to flood damage. Check that all electrical, heating, ventilating, plumbing, air conditioning equipment, and utility meters are located above the BFE. Ensure all water and

sewer pipes, electrical and telephone lines located below the BFE are waterproofed. If walls are used they must have permanent openings no more than one foot above grade (openings of at least one square inch for every square foot of lower area subject to flooding).

- Floodproofing for non-residential buildings only: The plans for a floodproofed building must be prepared by a registered engineer who must sign and seal a floodproofing certificate. The certified floodproofed elevation must be at least one foot above BFE.

Once you are assured that the building complies with all floodplain management measures, issue the permit. Make sure that the plans and any other assurances are made part of the application and maintained in your records. Also, keep in mind that permits may be required from state and federal agencies as well. Proceed to Step 7.

7 Make site inspections to ensure that the project is built according to the permitted plans. Document the as-built lowest floor elevations on the elevation certificate.

8 Keep all pertinent records. Retain all records, even for completed projects and denied permits.

- a copy of the permit application
- a copy of the permit review checklist
- a copy of all the engineering data (plans, specifications, hydraulic and hydrologic analyses) used to document a development's compliance with the NFIP floodway (no rise) and encroachment standards
- a copy of the engineering analyses submitted for a watercourse alteration project along with correspondence to neighboring communities and the State Water Resources Department
- copies of all correspondence relating to the project
- any variance or appeals proceedings
- documentation of the inspections of the development
- base flood elevation data for subdivisions of 5 acres or 50 lots
- elevation certificates for documenting lowest floor elevations, or floodproofing certificates
- a copy of the certificate of occupancy

- Certification of lowest floor elevations (including basement) of all new and substantially improved structures located in the designated floodplain
- Certification of the elevation to which non-residential structures have been floodproofed
- A file should be kept for the Biennial Reports that are submitted to FEMA. You may wish to keep the following information in this file also: (1) copies of previous years' annual and biennial reports; (2) a running total of permits and/or variances granted in the flood hazard area; (3) maps of new annexations or other boundary changes; and, (4) records of any man-made changes that effect flooding.

The Elevation Certificate

One of the requirements for participation in the National Flood Insurance Program (NFIP) is that communities "obtain the elevation of the lowest floor (including basement) of all new and substantially improved structures, and maintain a record of all such information". The Elevation Certificate form published by FEMA, is a way for communities to comply with this requirement.

Purpose of an Elevation Certificate

An elevation certificate is used for recording the elevation of the

lowest habitable floor, the crawlspace floor (if applicable), and the elevation of the mechanical/electrical components of all newly constructed buildings located in the floodplain. It is also used in determining the proper rate when purchasing flood insurance and for supporting a request for a Letter of Map Amendment (LOMA) or a Letter of Map Revision (LOMR).

Elevation Certificate form

The Elevation Certificate Form is required for use by all NFIP participating communities. It needs to be completed, stamped and signed by licensed engineer or surveyor (for Zones AE, A1-A30, AH, VE, V1-V30). For zones without BFEs (AO, A), a building official or property owner may complete the certificate. See Appendix B for a sample of the Elevation Certificate Form. FEMA's Elevation Certificate Form does not waive the requirement to purchase flood insurance. Only a LOMA or a LOMR can amend the FIRM and remove the Federal requirement for a lending institution to require the purchase of flood insurance. It is used as the basis for receiving a LOMA/LOMR, which can waive the flood insurance requirement.

Chapter 5 - NFIP Floodplain Development Standards

Floodway Standards

Floodways

No development is permitted in the floodway, unless a licensed engineer can certify through a scientific analysis that the development will cause no-rise to the BFE(s). This generally should include two studies: a step-backwater analysis and a conveyance compensation computation.

Please note that the "no rise" standard is to be interpreted exactly and strictly; that is, no-rise above the BFE will be permitted. Communities are encouraged to secure the services of an independent, third party, engineer to

General Standards

Anchoring

All structures are to be anchored to prevent hydrodynamic and hydrostatic forces from moving them from their foundations.

Construction Materials & Methods

The area below the lowest floor must be unfinished and remain free of water damage. This requires that new buildings and substantial improvements must be constructed with materials and by methods to resist or minimize flood damage.

Utilities

Utilities servicing flood prone structures must be floodproofed.

- Control panels must be located above the BFE.
- Heating, air conditioning, and ventilation equipment placed above BFE.
- Water supply systems and sanitary sewer systems designed or located to minimize or eliminate infiltration of floodwaters.

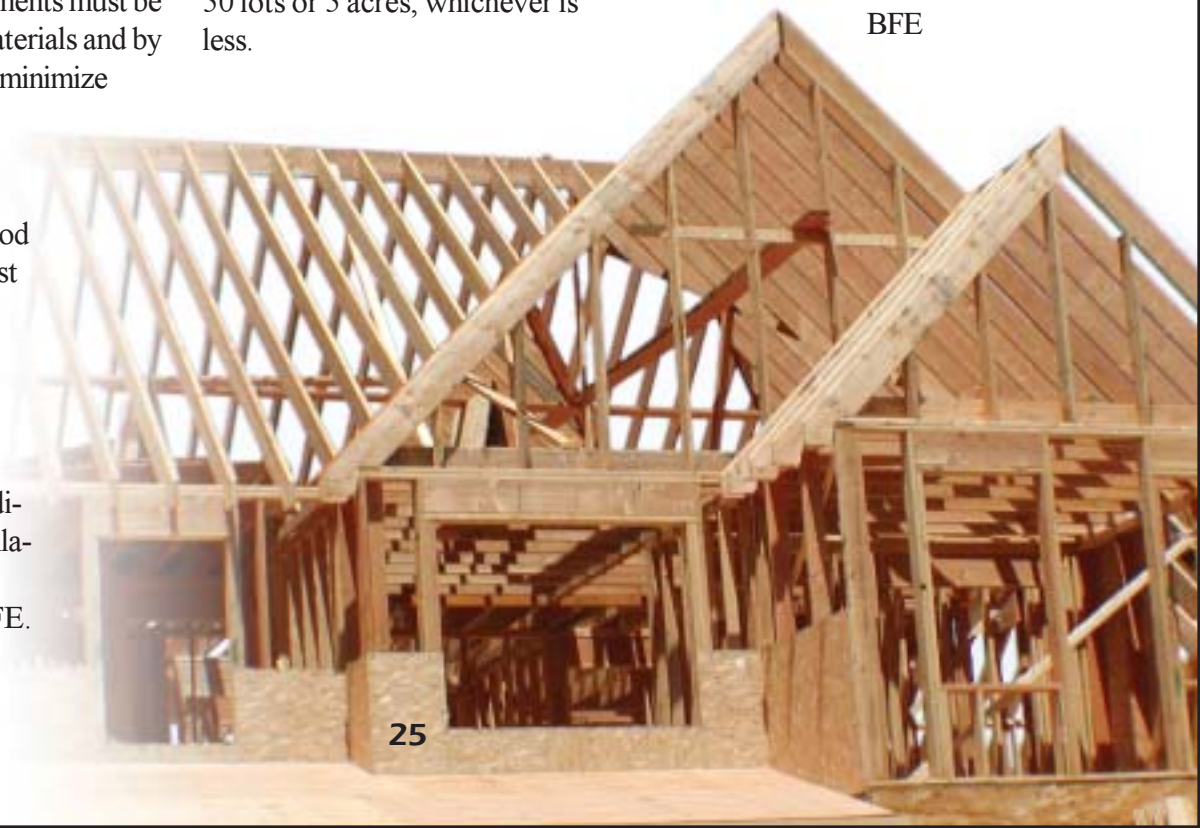
Subdivisions

All subdivisions must be designed to minimize flood damage and to not increase flood levels. Developers must provide BFE data (if unknown) for all subdivisions of 50 lots or 5 acres, whichever is less.

Note:

The following floodplain development standards are the minimum required for a community to participate and maintain eligibility in the NFIP. Many local communities and States have adopted higher floodplain regulatory standards. Always consult your local flood damage prevention ordinance for your particular community's floodplain development requirements.

- Flood levels should not increase when subdivisions are developed
- Recommend building sites be at least two feet above streets
- Lowest floor of all structures must be above BFE



- Protect utilities
- Ensure adequate drainage
- Streets should drain rapidly
- Require evacuation plan

Encroachments

Proposed developments cumulatively may not increase base flood heights more that one-foot anywhere in the identified floodplain. (Applies only to floodplains with BFEs but without identified floodways)

Watercourse Alterations

All watercourse alterations or modifications must not reduce the carrying capacity of the stream or increase BFEs.

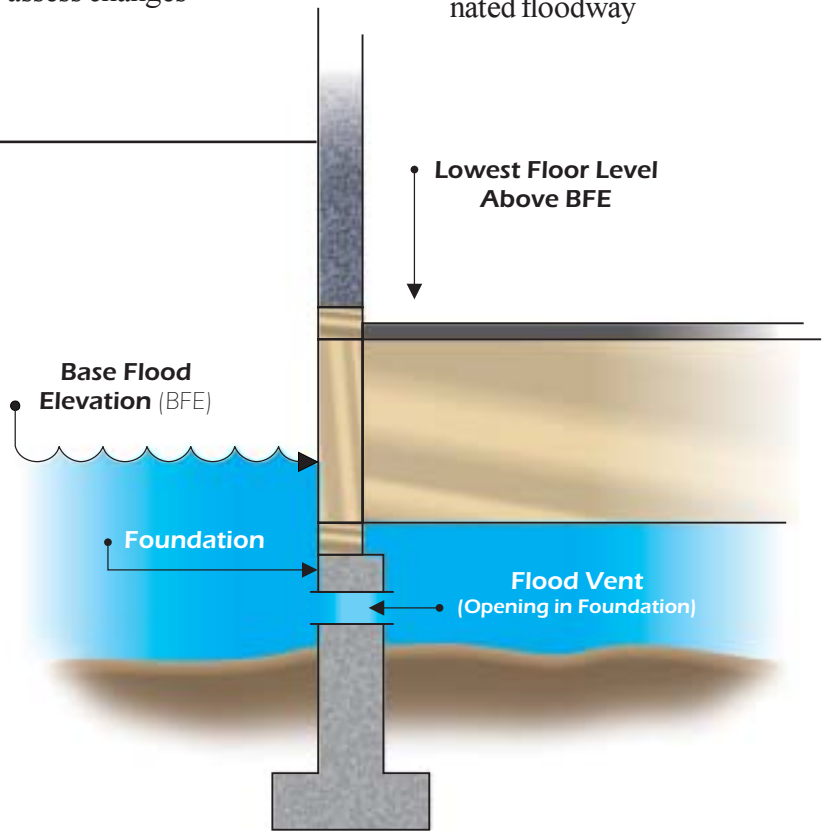
- Applicant must provide a thorough description of activity
- Compare existing channel capacity with proposed capacity and assess changes
- Alteration or modification must maintain carrying capacity of the watercourse
- Notify State Coordinating Office and adjacent communities of proposal
- Notify FEMA of any significant changes to watercourse
- Floodway regulations apply for alterations within a designated floodway

RESIDENTIAL STRUCTURES

Residential structures must have the lowest floor including basement elevated at least to or above the BFE. This elevation requirement can be accomplished by any of the following three (3) methods:

Foundation Stem Walls

Foundation stem walls extend the height of your current foundation. (See ***Figure A*** on the next page.) The foundation must have as a minimum two permanent openings no more than one foot above grade. The total area of the openings must be no less than 1 square inch for every square foot of enclosed space. This helps to relieve hydrostatic pressure on the foundation during a flood. Any cover placed over the openings must be able to open automatically during flood flows without human intervention. Screens are acceptable if they permit entry and exit of floodwater.



Fill Material

A poured slab placed over compacted fill can also be used to elevate the lowest floor of a structure above BFE. (See ***Figure B*** on the next page.) Please not that when a building site is filled, it is still in the floodplain and no basements are permitted.

Piers, Piles & Posts

This method is commonly used to avoid large fills and when flood heights are extreme. It is also the only acceptable means of construction in a V-Zone. (See ***Figure C*** on the next page.) The supporting members must be designed to resist hydrostatic and hydrodynamic forces.

Fully enclosed areas below can only be used for parking, access and limited storage. In addition, the following conditions must be met for any enclosed area below the BFE:

- Service equipment (e.g. furnaces, water heaters, washers/dryers, etc.) are NOT permitted below BFE.
- All walls, floors, and ceiling materials located below BFE must be unfinished and constructed of materials resistant to flood damage.
- The walls of any enclosed area below BFE must be designed by a registered professional engineer or architect in a manner to prevent lateral movement, collapse, or flotation of the structure. There must be at least two openings on each wall and the bottom of all openings must be no higher than one foot above grade.

Nonresidential Structures

Must have the lowest floor including basement elevated to or above the BFE, or floodproofed at least one foot above BFE. If floodproofed, structures must be dry-floodproofed, which means keeping the water out. Nonresidential (commercial) structures, together with attendant utility and sanitary facilities, are designed so that the structure is watertight below the base flood level. The walls are impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. Additionally, the structure must be designed to :

- Prevent seepage, collapse or cracking of basement walls
- Prevent buckling of basement floors
- Prevent backup of water from sewer lines.
- Have all openings located one foot above BFE

Meeting the Elevation Requirement

Below are three houses that display some ways to bring your new home in to compliance with NFIP standards when building in a floodplain. **Figure A** shows a home that has been elevated on pylons. **Figure B** shows a home elevated on fill. **Figure C** shows a home on an elevated foundation.

Figure C

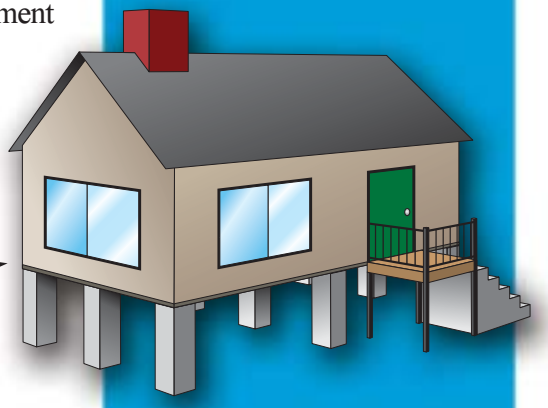


Figure A

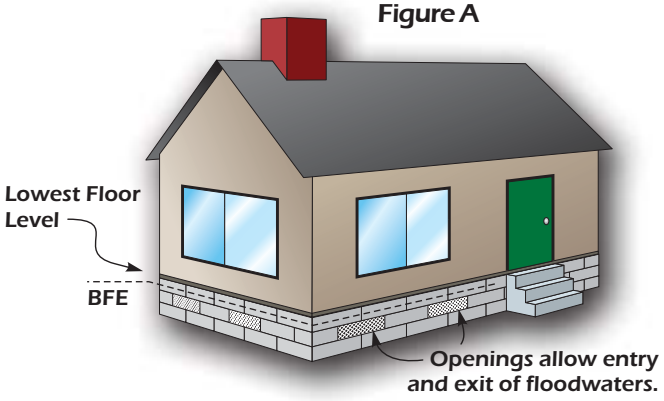
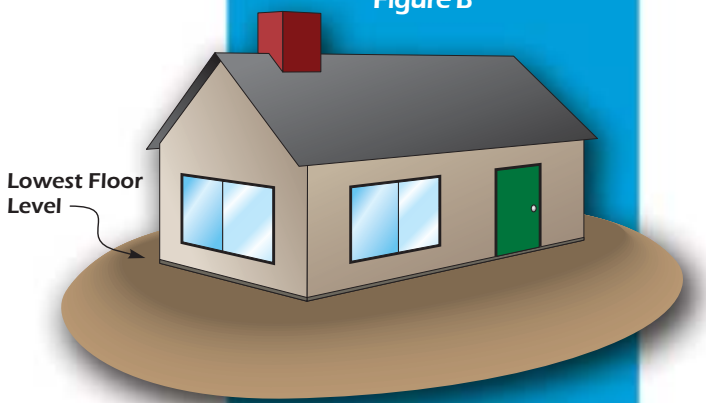


Figure B



- All protective features must operate automatically without human intervention

NOTE: Dry floodproofing measures must be certified by a licensed engineer and only apply to non-residential structures.

Basements & Crawlspaces

Any structure in a regulatory floodplain having it's lowest level (either finished or unfinished) below ground level (subgrade) on all four sides is not permissible under local flood damage prevention ordinance requirements and the regulations governing the NFIP. Therefore, neither basements nor excavated (subgrade) crawlspaces can be constructed in the regulatory floodplain.

At-Grade crawlspace

This type of crawlspace is illustrated in **Figure A** to the left. The interior and exterior grade of the crawlspace are at the same level. This is the proper method of construction

Excavated crawlspace

This type of crawlspace is illustrated in **Figure B** to the left. The crawlspace has been excavated to footers. The bottom level of the crawlspace is below grade on four sides. This type of crawlspace is generally not-permissible unless it meets the subgrade crawlspace requirements outlined in Technical Bulletin 11-01.

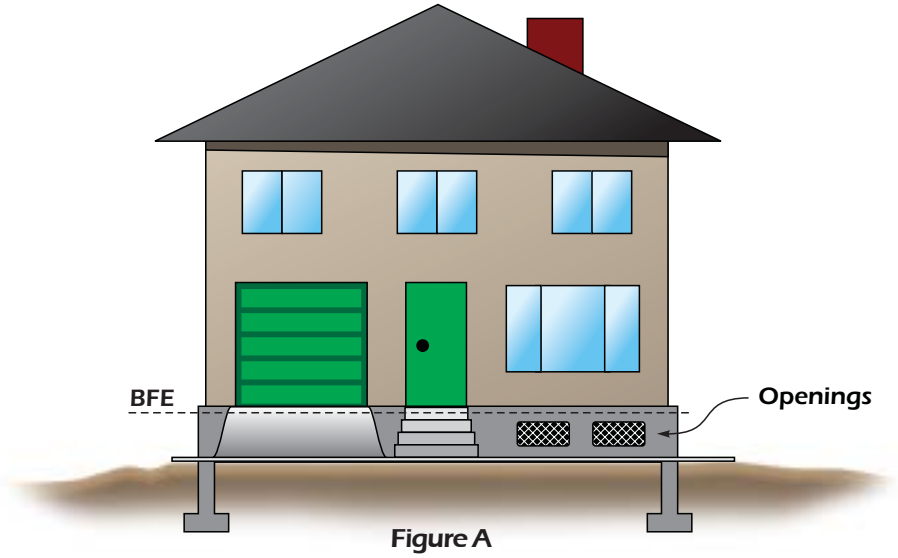


Figure A

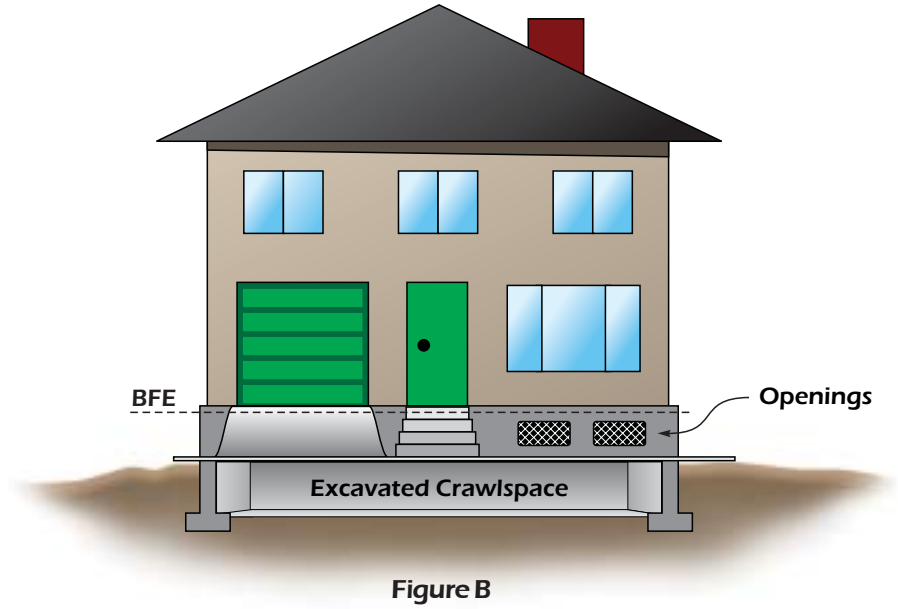


Figure B

Additional Permits

Ensure applicants obtain any additional state or federal permits prior to issuing your local floodplain development permits. One example is a "404" wetland permit from the U.S. Army Corps of Engineers.

MANUFACTURED HOUSING

As with standard homes, manufactured homes, often referred to as mobile homes, must adhere to NFIP standards as well. These standards are as follows:

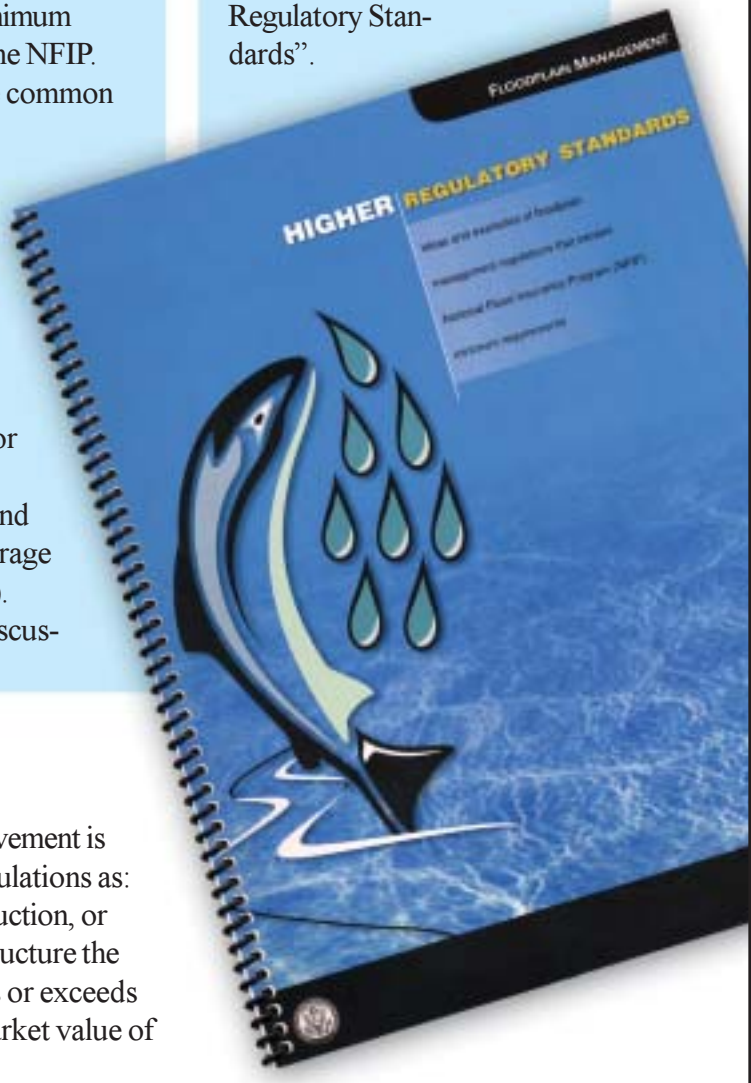
- Must be elevated to or above the BFE
- Homes on single lots must be elevated on permanent foundations to or above the base flood elevation (BFE).
- Homes in existing mobile home parks or subdivisions must be elevated on a permanent foundation and have either it's chassis elevated on foundations at least 36 inches above grade, or have it's lowest floor at or above BFE.
- For a mobile home park site or subdivision that has received substantial damage (over 50%), elevation must be to or above BFE.
- All mobile homes in flood hazard areas must be anchored to a permanent foundation.

Recreational Vehicles

RVs must be on site for less than 180 consecutive days, and be fully licensed and ready for highway use, or be elevated to or above the BFE and meet manufactured home anchoring standards.

HIGHER REGULATORY STANDARDS

In order to better meet their floodplain management goals, many communities have adopted flood damage prevention ordinances that go beyond the minimum requirements of the NFIP. Some of the more common higher regulatory floodplain management provisions adopted by communities include stream setbacks, freeboard (lowest floor one or more feet above the BFE) and compensatory storage for floodplain fills). For a thorough discussion of floodplain management provisions that exceed minimum NFIP requirements, see FEMA Region 10s publication "Higher Regulatory Standards".



SUBSTANTIAL IMPROVEMENT

A Substantial Improvement is defined by NFIP regulations as: Any repair, reconstruction, or improvement of a structure the cost of which equals or exceeds 50 percent of the market value of the structure either:

- before the improvement or repair started, or
- if the structure has been damaged and is being restored, before the damage occurred.

Any substantially improved structure must be brought into compliance with the NFIP requirements for new construction; in other words, it must be elevated (or floodproofed if it is a non-residential structure) to the flood protection elevation.

When a structure is substantially improved, it is considered a new "post-FIRM" structure, and

actuarial flood insurance rates would apply based on the lowest floor elevation of the structure.

Coastal Velocity Zone (V-Zones)

In addition to A-Zone development standards, additional construction specifications apply in coastal V-zones. Some of these requirements include:

- The bottom surface of the lowest horizontal structural member of the lowest floor must be elevated, at least, to or above the BFE using only piers, posts or piles;
- Fill is prohibited in V-zones;
- New or substantially improved structures can't be constructed seaward of mean high tide;
- Each building and foundation system must be certified by a registered professional engineer that it can withstand 100-year wind and water load forces;
- Enclosed areas below the BFE are prohibited.

Substantial Damage

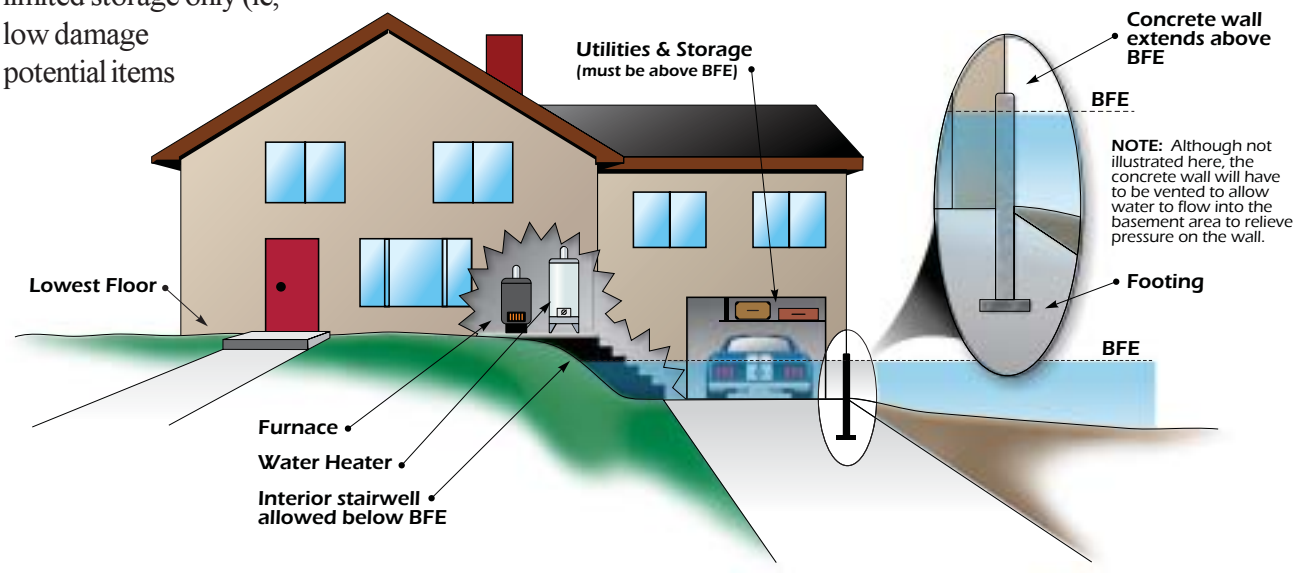
Substantially damaged buildings fall under the substantial improvement criteria. Substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition equals or exceeds 50 percent of the market value of the structure before the damage occurred.

Unnumbered A-Zones

In approximate study areas or unnumbered A-Zones (flood zones where the BFEs have not been determined), structures can be built with the lowest floor at grade—again no basements are allowed. However, it is recommended that the lowest floor be elevated at least two (2) feet above the highest adjacent grade. This is because flood insurance premiums are significantly less for structures built two feet above grade than for structures built at existing ground level. Remember that BFEs must be generated for all subdivisions of 50 lots or 5 acres, whichever is less. Many communities require that BFEs be generated for all developments in unnumbered A-zones either using FEMAs Quick-2 program, a complete step-backwater hydraulic analysis, or by using documented historical flood data.

Allowable Uses Below the BFE

Attached and detached garages, as well as minor storage sheds, may be constructed in the flood fringe with their lowest floor at grade provided that the "enclosure below BFE" rules are met. Meaning, the area can only be used for parking of vehicles and limited storage only (ie, low damage potential items like gardening tools, and spare tires); all mechanical and electrical systems and appliances must be elevated above the BFE; hydrostatic (flood vent) openings must be present; and flood resistant materials must be used in areas below the BFE.



CHAPTER 6 - FLOOD HAZARD MITIGATION

FLOODING IS A NATURAL EVENT

Flood damages only occur when man interferes with the natural flooding process by altering the watercourse, developing areas in the upper watershed, and/or building inappropriately within the floodplain. Approximately 90 percent of all federal disaster assistance payments to local governments and private citizens are a result of flood damages.

Flooding in the Northwest can be separated into several types including: overbank riverine floods, flash floods, alluvial fan floods, ice-jam floods, local drainage floods, groundwater floods, dam-break floods, coastal flooding, including storm surges and tsunamis, and fluctuating lake level floods. The traditional solution to flood problems has been to construct structural protection works such as dams, diversions, levees, and floodwalls. Despite tremendous expenditures for these structural projects, flood losses have continued to increase year after year. Given this, communities have begun to see the solution to avoiding flood damages lies not in keeping the water away from people, but rather in keeping people away from the water.

BUILDING PROTECTION MEASURES

Acquisition

In some instances it is more cost-effective for governments to purchase repetitively flooded houses and demolish or move them, than it is to constantly pay out disaster assistance and flood insurance claims. Once demolished or moved, the now cleared land is deed restricted as open-space and may be converted to a park, or reverted back to its natural state. Since 1993, FEMA has funded the acquisition of some 20,000 homes and businesses located in frequently flooded areas throughout the country.

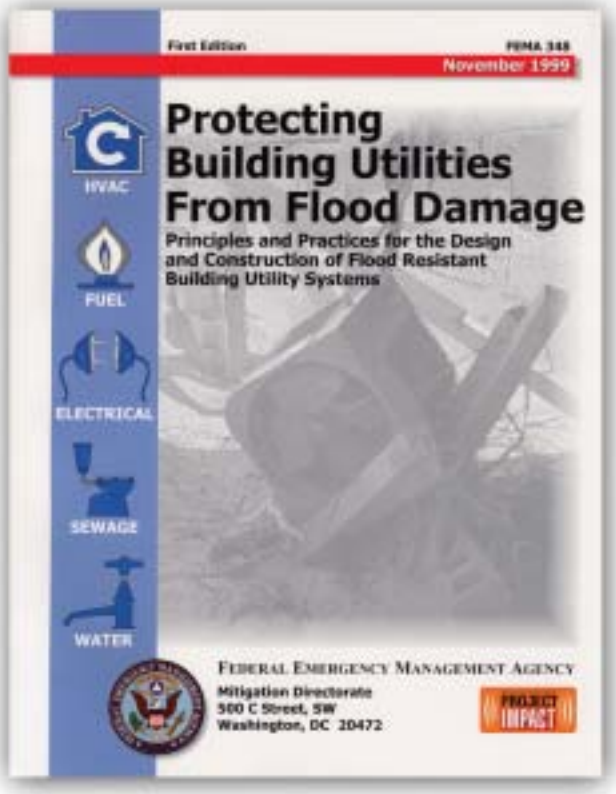
Elevated home in Douglas County, OR

Relocation

Similar to acquisition, relocation involves physically moving a house from the floodplain and placing it out of harm's way.

Elevation

Next to acquisition or relocation, raising an existing structure above the flood level is the next best solution to protecting a structure from flood damage. Structures can be elevated on posts or piles where the water can flow under the building, causing little or no damage to the structure and its contents.



This publication is available from FEMA.

Dry-floodproofing

A dry floodproofed building is sealed against floodwaters. All areas located below the flood level are made watertight. Openings like doors, vents, and sewer lines are either closed permanently, or constructed with automatically closing valves/vents or removable shields.

Wet-floodproofing

With wet floodproofing, floodwaters are intentionally allowed into the building to minimize water pressure on a structure's foundation. Damage is avoided by taking simple measures like moving furniture and appliances to areas above the flood level, or by elevating vulnerable equipment, electrical controls, furnaces and water heaters.

Sewer-backup Protection

Overloaded sewers can be prevented from backing up into a home or business by using a variety of plumbing alterations such as; a floor drain plug, or backflow valve.

Typical anti-backflow valve

Planning

Comprehensive Land Use Plans

These plans specify where development should and should not occur in a community. Through these plans, use of the land can be tailored to take into account the natural hazard threat. For instance, flood-prone areas can be reserved for parks, golf courses, backyards, or natural areas. Though these plans may have limited authority, they often drive other local measures such as zoning and subdivision ordinances.

Capital Improvement Plans

These plans detail where major public expenditures are to be made over next 5 to 20 years and include funding decisions for such things as acquiring parkland, and improving roads, bridges, and utilities. These publicly funded projects should be geared, first and foremost, to avoiding the natural hazard threat. If the hazard cannot be totally avoided, then projects should be constructed in such a way as to minimize the damage that will occur when disaster strikes.

Hazard Mitigation Plans

Many communities have developed a stand-alone hazard mitigation plan that identifies the hazard threat and then tailors a range of non-structural, structural, and land-use regulatory activities to remove or significantly decrease the damage and economic loss caused by future flooding.

Snake River Jefferson County, ID

Open Space Uses

Land Acquisition

The best way to prevent flood damage is to keep the floodplain free of development. Local governments or community groups can purchase flood-prone lands and set the areas aside for open-space uses such as recreational or wildlife habitat.

Purchase Easements/ Development Rights

Easements are another method of keeping development out of sensitive flood areas. With an easement, a private owner is free to use the property, but agrees not to build on the flood-prone side of their property that has

been set aside in the easement. In exchange, a payment is either made to the owner, or property taxes are lowered. Many communities have purchased development rights to agricultural areas located in the floodplain in sprawling near-urban areas. In this way, farmers and ranchers can continue to produce their product while precluding the most flood-prone land from being subdivided and developed.

Regulatory / Local Ordinance Measures

Zoning Ordinance

In a zoning ordinance, floodplains can be designated as one or more zoning districts in which development is prohibited or allowed only if it is constructed to minimize flood damage (per the requirements of the National Flood Insurance Program and local Floodplain Management Ordinances). Some types of flood districts are dedicated for recreation, public use, conservation, or cluster developments that keep houses out of floodplains. Often, the flood zone designation takes the form of an overlay or combining zone.

Subdivision Ordinances

These regulations determine how land will be broken down into individual lots. They also state how homes should be sited in relation to the floodplain (preferably outside), and they set construction and location standards for the infrastructure that will service the subdivision.

Building Codes

Flood protection standards should be incorporated into the local building code. At a minimum they should ensure that the lowest floor of the structure is built above the base flood elevation (BFE), and that the foundation will withstand flood forces. Certain minimum standards are in the Uniform Building Code, and this code is either required or recommended in all northwest states.

Floodplain Management Ordinances

Most communities participate in the National Flood Insurance Program (NFIP) and therefore have adopted Floodplain Management Ordinances. However, many communities go beyond the minimum requirements of the NFIP and adopt higher regulatory standards in their flood ordinances (e.g., more restrictive floodways, freeboard above the BFE, riparian setbacks, compensatory storage, etc.).

Developers are required to build on-site detention basins to handle increased runoff.

Stormwater Management Regulations

These require developers to build on-site detention basins to handle the increased runoff caused by new developments with large impervious areas (subdivisions,

Community Rating System (CRS)

The National Flood Insurance Program (NFIP) Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP by reducing flood insurance premiums for the community's property owners. Discounts to premiums range from 5% to 45%. To receive credit in the CRS, a community can choose to undertake some or all of the 18 floodplain management and public information activities that comprise the CRS. Many of the flood mitigation activities outlined in this section are eligible for CRS credit.

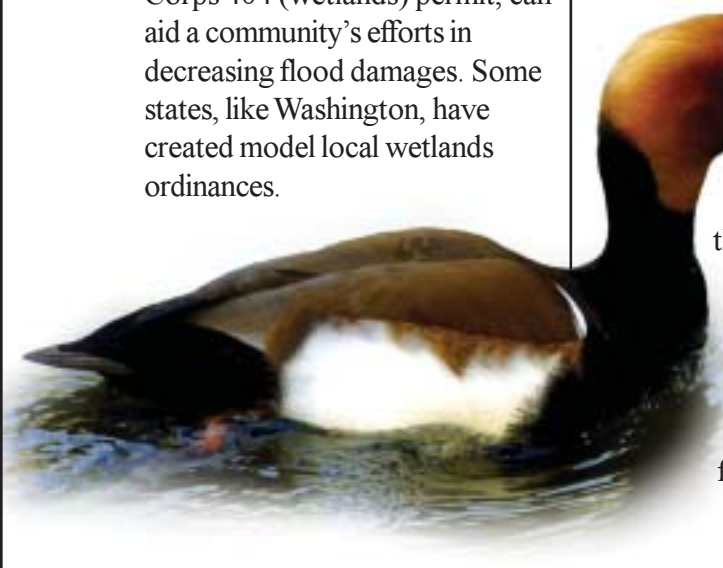
shopping malls, etc.). Stormwater is not allowed to leave the property at a rate higher than its predeveloped condition. In addition, stormwater regulations can address the problem of sedimentation, which can fill in channels and lakes, reducing their ability to carry or store floodwaters. One way to keep sediment from entering nearby streams and rivers is to require sediment traps at new construction sites.

Post-Disaster Recovery Ordinance

This ordinance establishes a recovery organization that authorizes a variety of pre- and post-event planning and regulatory powers and procedures related to disaster recovery and reconstruction.

Wetlands Protection

Wetlands can store large amounts of floodwaters, slow and reduce downstream flows and protect shorelines from erosion. Efforts to preserve wetlands, especially smaller ones not covered by a Corps 404 (wetlands) permit, can aid a community's efforts in decreasing flood damages. Some states, like Washington, have created model local wetlands ordinances.



Other Mitigation Ideas

Floodplain Mapping

FEMA has mapped floodplain areas in over 12,000 communities across the country. However, many of these maps are over a decade old. In addition, many areas, especially smaller watersheds, have never been mapped. In response to this, many local governments have conducted their own flood studies, and based on this data, regulate development accordingly.

Comprehensive Watershed Tax

In order to raise funds to carry out flood mitigation projects, some communities have passed levies to tax property owners in a particular watershed. The amount of taxes can be based on the subwatershed where one lives, the value of one's property, or the amount of impervious area on each parcel.

Real Estate Disclosure

Often homebuyers are already committed to purchasing a property before their lending institution informs them, under Federal law, that the home they are interested in is in the floodplain. Real estate listings stating whether a property is located in a regulatory floodplain and whether a structure has suffered past flooding or sewer backup problems could help the consumer make a better-informed decision.

Drainage System Maintenance

Regular maintenance is needed to clean out channels and detention basins blocked by debris. A proper drainage system maintenance plan should do more than remove detritus from ditches. It should also include regulations preventing dumping, filling or altering of a watercourse.

Culverts also require regular maintenance to keep floodwaters flowing freely

Community Outreach

Some communities have provided low-interest loans, tax breaks or grants to individual property owners to flood retrofit their homes. Also, local governments can inform citizens of the flood threat through a myriad of means,

and can also provide technical assistance on such things as improving local drainage and floodproofing options.

Flood Warning

A flood threat recognition system provides early warning of an impending flood. The warning can be disseminated via sirens, a mobile public address system, radio or television. However, a flood warning system does not provide long-term damage reduction otherwise provided by a comprehensive flood mitigation program.

Fish Enhancement Projects

Due to declining fishery stocks in the Northwest, numerous structures to enhance fish habitat are being placed in streams and rivers. These various barbs and drop structures should be designed so that they do not increase flood heights.

Hazardous Materials

Petroleum products, chemicals and other toxic substances located in the floodplain should be identified, and where possible, relocated out of the floodplain. At a minimum, drums and gas and liquid storage tanks containing toxic substances should be elevated and properly anchored – these items can become floating debris that may strike buildings or plug bridge openings causing increased flood heights and damages.

Dam Failure

Several thousand regulated dams nationwide are categorized as high-hazard, that is, their failure will likely cause significant loss of life and property. Many dams have been built with improper spillways, and downstream development is increasing. To avoid failure, dams should be identified and then inspected on a regular basis. Spillway capacities should be increased if deemed necessary.

Structural Measures

There are various types of structural measures that can be constructed to protect properties, including levees, floodwalls, reservoirs, as well as other activities such as limited dredging and channel modifications. However, history has proven that reliance on structural flood control measures can create a false sense of security, which often leads to even greater destruction when these structural projects fail during a large flood event. However, localized structural measures are often necessary to protect existing critical facilities that are water dependent, like water and wastewater treatment plants.

GLOSSARY

Anchoring
Special connections made to ensure that a building will not float or be pushed off its foundation during a flood.

Appeal
A request to higher authority such as a Board of Appeals or a City Council to overrule a permit denial because the applicant claims that the ordinance has been incorrectly interpreted.

BFE (Base Flood Elevation)
The elevation of the crest of the base flood.

Base Flood
The flood having a one percent chance of being equaled or exceeded in any given year (often called the 100-year or one percent chance flood).

Basement
Any area of a building having its floor below ground level on all sides.

Best Available Data
Most recent hydraulic and hydrologic information that show the 100-year flood elevations and floodplain boundaries in a particular area.

Building
A structure that is principally above ground and enclosed by walls and a roof. Includes manufactured homes, prefabricated buildings, plus recreational vehicles or travel trailers installed on a site for more than 180 days.

Floodplain Manager
Individual who administers and enforces a community's floodplain ordinance. Depending on the local ordinance, this person could be a city engineer, building inspector, mayor, clerk, zoning administrator, or other official.

Coastal High Hazard Area
An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The area is designated on the FIRM as Zone V1, V30, VE, or V.

CFR
Code of Federal Regulations. A master coding system to identify the federal agency regulations that have been published in the Federal Register. 44 CFR includes all the regulations published by the Federal Emergency Management Agency.

Cross section
Survey information that records the dimensions of a channel and floodplain at right angles to flow.

CRS (Community Rating System)
A program of the FIA where communities who regulate floodplain areas above and beyond minimum NFIP requirements are rewarded for their efforts through reduced flood insurance premiums for the citizens of that community.

Datum
Reference point used to insure all elevation records are properly related. Many communities had their own datum developed before there was a national standard. The majority of flood insurance studies currently use National Geodetic Vertical Datum (NGVD).

Development
Any man-made change to the ground that may affect flood flows. Development includes buildings, filling, channel changes, dredging, grading, excavating and storage of materials

Discharge
The amount of water that passes a point. Discharge is usually measured in cubic feet per second. For flood studies the peak flood discharge is the greatest amount of water that will pass a point at the crest of the flood.

Elevation Certificate
A form supplied by the Federal Emergency Management Agency (FEMA) and used to document the lowest floor elevation of a building.

FEMA
Federal Emergency Management Agency. Administers the NFIP.

FHBM
See: "Flood Hazard Boundary Map"

FIA
Federal Insurance Administration. Part of FEMA responsible for the NFIP.

FIRM
See "Flood Insurance Rate Map".

FIS
Flood Insurance Study. A booklet that provides detailed information on a community's flood hazard areas. The FIS normally includes topographic information, floodplain and floodway data charts, study information, and stream profiles.

Flood Hazard Boundary Map (FHBM)
An approximate NFIP map produced for communities that are not in the regular program or communities that have limited development potential.

Flood Insurance Rate Map (FIRM)
The map provided to communities in the Regular Phase of the NFIP. It delineates a Special Flood Hazard Area or floodplain where regulations apply. FIRMs often include base flood elevations.

Floodplain
Land area subject to flooding.

Floodproofing
Protection measures made to a building that is not elevated above the flood level to ensure that floodwaters do not damage it. Dry floodproofing consists of ensuring that the walls and floor are watertight and capable of withstanding hydrostatic pressures and hydrodynamic forces. Wet floodproofing permits water to enter the building and seek its own level to alleviate hydrostatic pressure.

Floodway
The channel of a river and the portion of the floodplain that carries most of the flood. Regulations require that the floodway be kept open so that flood flows are not obstructed or diverted onto other properties.

Floodway Data Table
The table provided in the flood insurance study which provides detailed information for each cross section on streams studied in detail.

404 Permit
A permit required by Section 404 of the Clean Water Act to protect rivers and adjacent wetlands from being filled. The U.S. Army Corps of Engineers administers this permit program.

Freeboard
An extra margin of safety added to the base flood elevation to protect structures from waves, debris, or other unpredictable hazards that accompany the base flood.

Hydraulics
The study of moving water. The hydraulic analysis in a flood insurance study calculates how high and how fast a flood discharge flows.

Hydrodynamic Forces
The forces on a structure from current, waves, ice, etc.

Hydrology
The science dealing with the waters of the earth. A hydrologic study calculates flood discharges.

Hydrostatic Pressure
The pressure that standing water places on the walls and floor of a structure. Hydrostatic pressure of 3-4 feet of standing water can collapse walls or buckle basement floors.

LOMA
Letter of Map Amendment that FEMA issues for a structure or parcel of land that was inadvertently included in the floodplain, thereby waiving the mandatory flood insurance purchase requirements of most lending institutions.

LOMR
Letter of Map Revision. FEMA issues LOMR when changes to the effective floodplain map are made such as floodway/floodplain boundaries, base flood elevations, or authorized fill.

Lowest Floor
The lowest floor of the lowest enclosed area (including basement) of a building. Note: An

unfinished or flood resistant enclosure other than a basement area used solely for parking vehicles, building access or storage, is not considered a building's lowest floor provided that such an enclosure is built in accordance with the floodplain ordinance.

Manufactured Home
Transportable structure of one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle."

NFIP
National Flood Insurance Program

NGVD
National Geodetic Vertical Datum used by the National Flood Insurance Program. NGVD is based on mean sea level and has also been called "1929 Mean Sea Level."

Ponding
Flooding condition caused when rain runoff pools in a location that has no ready outlet. Ponding water usually stands until it is able to seep into the ground. Its a common problem in levee areas, flat areas, and in communities where construction of streets and other development has blocked the natural outlets.

Profile
A graph showing the water surface elevations of a flood at any particular location along the stream.

"Q"
An abbreviation used by engineers to stand for discharge, usually given in cubic feet per second (cfs).

Recreational Vehicle
A vehicle that is:

- Built on a single chassis;
- 400 square feet or less when measured at the largest horizontal projection;
- Designed to be self-propelled or permanently towable by a light duty truck; and
- Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

Riverine
Produced by a river. Riverine floodplains have readily identifiable channels and are regulated differently than floodplains caused by ponding, sheet flow or lake shore flooding.

Roughness
In flood studies, a factor that accounts for surface conditions that affect flood flows. A floodplain with a lot of trees and brush will have a high roughness factor while open spaces and paved areas will have law roughness factors.

SFHA
Special Flood Hazard Area. The term used by the National Flood Insurance Program for the floodplain identified on the flood insurance maps.

Structure
A walled and roofed building including a gas or liquid storage tank that is principally above ground.

Substantial Improvement
There are three occasions when work on an existing building is considered a substantial improvement:

1 An improvement made to a building that exceeds 50% of the value of the building.

2 Reconstruction or repair of a building, that exceeds 50% of the value of the building before it was damaged.

3 Additions to an existing building when the addition increases the market value of a structure by more than 50% or the floor area by more than 20%.

Note: If a building is substantially improved or substantially, then it must be protected from the base flood (ie, elevated above the BFE).

Topographic Map
A map showing elevation contour lines.

Uplift
Hydrostatic pressure placed on a floor as water below the floor tries to rise.

Use Permit
A permit issued after a development project is complete and the property has passed all the necessary inspections. Depending on the local ordinance provisions, a building cannot be occupied nor can a site be used unless a use permit or a certificate of use and occupancy is issued by the building official.

Variance
A request to be relieved of one or more ordinance requirements because the ordinance affects the property in a unique and special way.

RESOURCES

The information in this book was obtained from many different sources; mostly from various other FEMA publications. These other publications can be obtained by contacting FEMA Region10. These list of sources are as follows:

Chapter 1

- FEMA Publication, "Protecting Floodplain Resources, A Guidebook for Communities"

Chapter 2

- FEMA Publication 258, "How to Use a Flood Map to Protect Your Property"
- FEMA Publication 265, "Mapping Floodplain Development in Approximate Zone Areas, A Guide for Obtaining and Developing Base (100-year) Flood Elevations"
- FEMA Publication 311, "Substantial Damage Estimator"

Chapter 3

- FEMA Publication 186, "Mandatory Purchase of Flood Insurance Guidelines."

Chapter 5

- FEMA Publication 311, "Substantial Damage Estimator"
- FEMA Publication 85, "Manufactured Home Installation in Flood Hazard Areas"
- FEMA Publication 54, "Elevated Residential Structures"
- FEMA Publication #348 Protecting Building Utilities From Flood Damage

Chapter 6

- FEMA Publication #102 Design Guidelines for Flood Damage Reduction
- FEMA Publication #114 Retrofitting Flood-prone Residential Structures
- FEMA Publication 348, "Protecting Building Utilities From Flood Damage"
- FEMA Publication: Subdivision Design in Flood Hazard Areas

APPENDIX A - MODEL FLOODPLAIN DEVELOPMENT PERMIT

EXAMPLE

Application for Permit To Develop in a Floodplain Area

The undersigned hereby makes application for a permit to develop in a designated floodplain area. The work to be performed is described below and in attachments hereto. The undersigned agrees that all such work shall be done in accordance with the requirements of the ___(City/County)___ Floodplain Ordinance and with all other applicable local, State and Federal regulations. This application does not create liability on the part of the ___(City/County)___or any officer or employee thereof for any flood damage that results from reliance on this application or any administrative decision made lawfully thereunder.

Owner:_____ Builder:_____
Address:_____ Address:_____
_____ _____
Telephone:_____ Telephone:_____

Address of Property: _____
_____

A. Description of Work (Complete for All Work):

1. Proposed Development Description:
   - ☐ New Building
   - ☐ Improvement to Existing Building
   - ☐ Manufactured Home
   - ☐ Filling
   - ☐ Other _____

2. Size and location of proposed development (attach site plan):
   _____
   _____

3. Is the proposed development in a Special Flood Hazard Area (Zones A, AE, A1-A30, AH, or AO)?
   Yes ☐ No ☐

4. Per the floodplain map, what is the zone and panel number of the area of the proposed development?
   Zone _____ **Panel Number** _____

5. Are other Federal, State or local permits obtained?
   Yes ☐ No ☐
   Type:_____

6. Is the proposed development in an identified floodway?
   Yes ☐ No ☐

7. If yes to #6, is a "No Rise Certification" with supporting data attached?
   Yes ☐ No ☐

Front Side

EXAMPLE

Application for Permit To Develop in a Floodplain Area

The undersigned hereby makes application for a permit to develop in a designated floodplain area. The work to be performed is described below and in attachments hereto. The undersigned agrees that all such work shall be done in accordance with the requirements of the ___(City/County)___ Floodplain Ordinance and with all other applicable local, State and Federal regulations. This application does not create liability on the part of the ___(City/County)___or any officer or employee thereof for any flood damage that results from reliance on this application or any administrative decision made lawfully thereunder.

Owner:_____ Builder:_____
Address:_____ Address:_____
_____ _____
Telephone:_____ Telephone:_____

Address of Property: _____
_____

A. Description of Work (Complete for All Work):

1. Proposed Development Description:
   - ☐ New Building
   - ☐ Improvement to Existing Building
   - ☐ Manufactured Home
   - ☐ Filling
   - ☐ Other _____

2. Size and location of proposed development (attach site plan):
   _____
   _____

3. Is the proposed development in a Special Flood Hazard Area (Zones A, AE, A1-A30, AH, or AO)?
   Yes ☐ No ☐

4. Per the floodplain map, what is the zone and panel number of the area of the proposed development?
   Zone _____**Panel Number** _____

5. Are other Federal, State or local permits obtained?
   Yes ☐ No ☐
   Type:_____

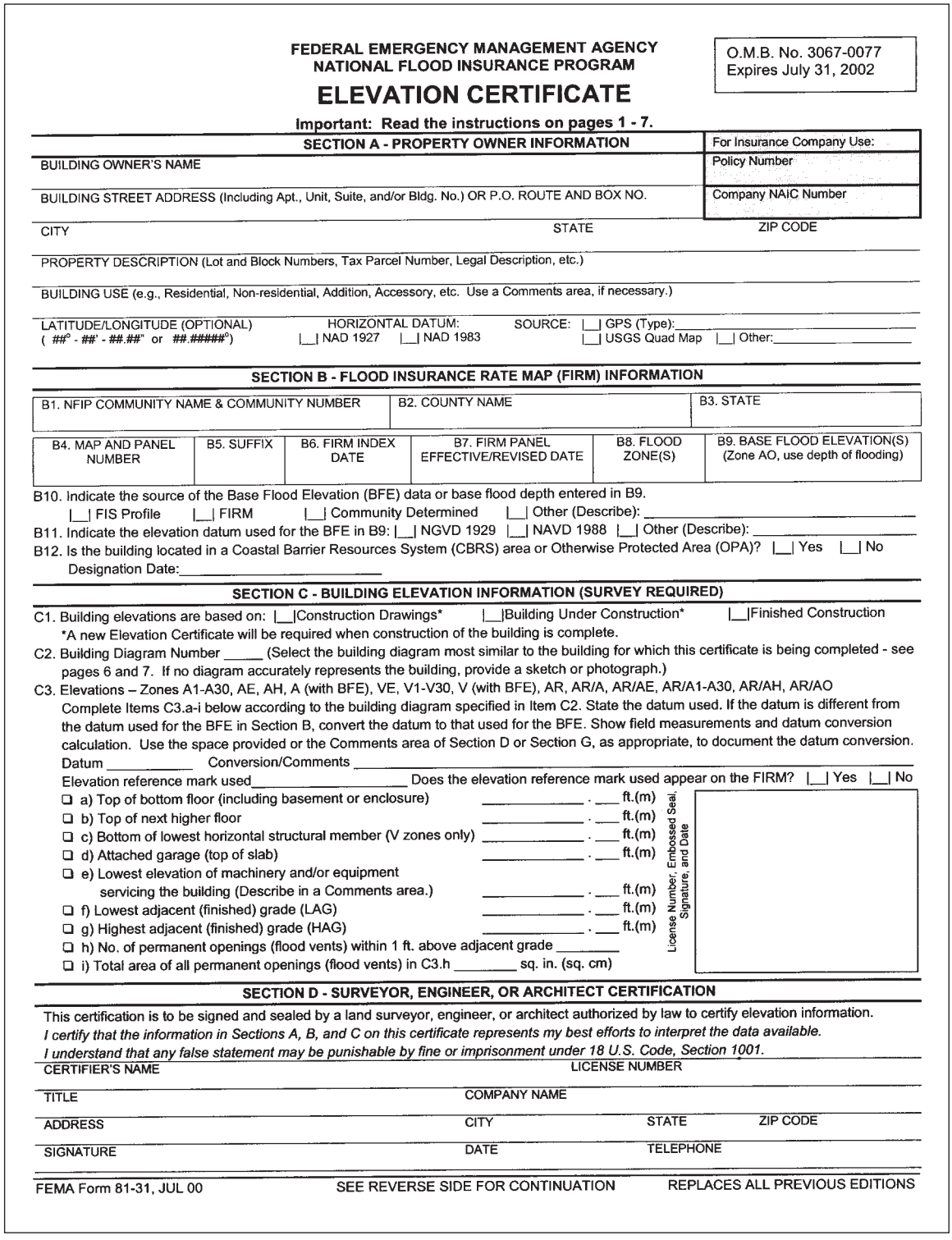
6. Is the proposed development in an identified floodway?
   Yes ☐ No ☐

7. If yes to #6, is a "No Rise Certification" with supporting data attached?
   Yes ☐ No ☐

Back Side

APPENDIX B - ELEVATION CERTIFICATE FORM

Elevation certificates can be obtained by contacting FEMA Region 10 at (425) 487-4600 or by visiting the FEMA website at www.fema.gov.



FEDERAL EMERGENCY MANAGEMENT AGENCY
NATIONAL FLOOD INSURANCE PROGRAM

O.M.B. No. 3067-0077
Expires July 31, 2002

ELEVATION CERTIFICATE

Important: Read the instructions on pages 1 - 7.

SECTION A - PROPERTY OWNER INFORMATION

BUILDING OWNER'S NAME

BUILDING STREET ADDRESS (Including Apt., Unit, Suite, and/or Bldg. No.) OR P.O. ROUTE AND BOX NO.

CITY STATE ZIP CODE

For Insurance Company Use:
Policy Number
Company NAIC Number

PROPERTY DESCRIPTION (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)

BUILDING USE (e.g., Residential, Non-residential, Addition, Accessory, etc. Use a Comments area, if necessary.)

LATITUDE/LONGITUDE (OPTIONAL) (##° - ##' - ##.##" or ##.######°) HORIZONTAL DATUM: |__| NAD 1927 |__| NAD 1983 SOURCE: |__| GPS (Type):_____ |__| USGS Quad Map |__| Other:_____

SECTION B - FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP COMMUNITY NAME & COMMUNITY NUMBER	B2. COUNTY NAME	B3. STATE

B4. MAP AND PANEL NUMBER	B5. SUFFIX	B6. FIRM INDEX DATE	B7. FIRM PANEL EFFECTIVE/REVISED DATE	B8. FLOOD ZONE(S)	B9. BASE FLOOD ELEVATION(S) (Zone AO, use depth of flooding)

B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in B9.
|__| FIS Profile |__| FIRM |__| Community Determined |__| Other (Describe): _____
B11. Indicate the elevation datum used for the BFE in B9: |__| NGVD 1929 |__| NAVD 1988 |__| Other (Describe): _____
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? |__| Yes |__| No
Designation Date:_____

SECTION C - BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: |__|Construction Drawings* |__|Building Under Construction* |__|Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.
C2. Building Diagram Number _____ (Select the building diagram most similar to the building for which this certificate is being completed - see pages 6 and 7. If no diagram accurately represents the building, provide a sketch or photograph.)
C3. Elevations – Zones A1-A30, AE, AH, A (with BFE), VE, V1-V30, V (with BFE), AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO
Complete Items C3.a-i below according to the building diagram specified in Item C2. State the datum used. If the datum is different from the datum used for the BFE in Section B, convert the datum to that used for the BFE. Show field measurements and datum conversion calculation. Use the space provided or the Comments area of Section D or Section G, as appropriate, to document the datum conversion.
Datum _____ Conversion/Comments _____
Elevation reference mark used_____ Does the elevation reference mark used appear on the FIRM? |__| Yes |__| No

- ❑ a) Top of bottom floor (including basement or enclosure) _____ . ___ ft.(m)
- ❑ b) Top of next higher floor _____ . ___ ft.(m)
- ❑ c) Bottom of lowest horizontal structural member (V zones only) _____ . ___ ft.(m)
- ❑ d) Attached garage (top of slab) _____ . ___ ft.(m)
- ❑ e) Lowest elevation of machinery and/or equipment servicing the building (Describe in a Comments area.) _____ . ___ ft.(m)
- ❑ f) Lowest adjacent (finished) grade (LAG) _____ . ___ ft.(m)
- ❑ g) Highest adjacent (finished) grade (HAG) _____ . ___ ft.(m)
- ❑ h) No. of permanent openings (flood vents) within 1 ft. above adjacent grade _____
- ❑ i) Total area of all permanent openings (flood vents) in C3.h _____ sq. in. (sq. cm)

License Number, Embossed Seal, Signature, and Date

SECTION D - SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information.
I certify that the information in Sections A, B, and C on this certificate represents my best efforts to interpret the data available.
I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.

CERTIFIER'S NAME LICENSE NUMBER

TITLE COMPANY NAME

ADDRESS CITY STATE ZIP CODE

SIGNATURE DATE TELEPHONE

FEMA Form 81-31, JUL 00 SEE REVERSE SIDE FOR CONTINUATION REPLACES ALL PREVIOUS EDITIONS

Front side

IMPORTANT: In these spaces, copy the corresponding information from Section A.			For Insurance Company Use:
BUILDING STREET ADDRESS (Including Apt., Unit, Suite, and/or Bldg. No.) OR P.O. ROUTE AND BOX NO.			Policy Number
CITY	STATE	ZIP CODE	Company NAIC Number

SECTION D - SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION (CONTINUED)

Copy both sides of this Elevation Certificate for (1) community official, (2) insurance agent/company, and (3) building owner.

COMMENTS

|__| Check here if attachments

SECTION E - BUILDING ELEVATION INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE)

For Zone AO and Zone A (without BFE), complete Items E1. through E4. If the Elevation Certificate is intended for use as supporting information for a LOMA or LOMR-F, Section C must be completed.

E1. Building Diagram Number _____ (Select the building diagram most similar to the building for which this certificate is being completed – see pages 6 and 7. If no diagram accurately represents the building, provide a sketch or photograph.)

E2. The top of the bottom floor (including basement or enclosure) of the building is |__|__| ft.(m) |__|__|in.(cm) |__| above or |__| below (check one) the highest adjacent grade. (Use natural grade, if available.)

E3. For Building Diagrams 6-8 with openings (see page 7), the next higher floor or elevated floor (elevation b) of the building is |__|__| ft.(m) |__|__|in.(cm) above the highest adjacent grade. Complete Items C3.h and C3.i on front of form.

E4. For Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? |__| Yes |__| No |__| Unknown. The local official must certify this information in Section G.

SECTION F - PROPERTY OWNER (OR OWNER'S REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, C (Items C3.h and C3.i only), and E for Zone A (without a FEMA-issued or community-issued BFE) or Zone AO must sign here. *The statements in Sections A, B, C, and E are correct to the best of my knowledge.*

PROPERTY OWNER'S OR OWNER'S AUTHORIZED REPRESENTATIVE'S NAME

ADDRESS CITY STATE ZIP CODE

SIGNATURE DATE TELEPHONE

COMMENTS

|__| Check here if attachments

SECTION G - COMMUNITY INFORMATION (OPTIONAL)

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C (or E), and G of this Elevation Certificate. Complete the applicable item(s) and sign below.

G1. |__| The information in Section C was taken from other documentation that has been signed and embossed by a licensed surveyor, engineer, or architect who is authorized by state or local law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)

G2. |__| A community official completed Section E for a building located in Zone A (without a FEMA-issued or community-issued BFE) or Zone AO.

G3. |__| The following information (Items G4-G9) is provided for community floodplain management purposes.

G4. PERMIT NUMBER	G5. DATE PERMIT ISSUED	G6. DATE CERTIFICATE OF COMPLIANCE/OCCUPANCY ISSUED

G7. This permit has been issued for: |__| New Construction |__| Substantial Improvement

G8. Elevation of as-built lowest floor (including basement) of the building is: _____ . ___ ft.(m) Datum: _____

G9. BFE or (in Zone AO) depth of flooding at the building site is: _____ . ___ ft.(m) Datum: _____

LOCAL OFFICIAL'S NAME TITLE

COMMUNITY NAME TELEPHONE

SIGNATURE DATE

COMMENTS

|__| Check here if attachments

FEMA Form 81-31, JUL 00 REPLACES ALL PREVIOUS EDITIONS

Back side